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The

Principles, Methods, and Costs of Operation West

of the Cascades in Oregon and Washington

with Respect to Timber Appraisals.

Part 4

by

W. H. Gibbons, Forest Examiner.

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PART IV

PART IV

Cost of Logging, Camp 1, Washington.

The following deals with the cost of logging at a rather large operation in the Pacific Northwest during the years 1910, 1911 and 1912. Most of the data was taken from the books and papers of the company, and all of it is correct. It has not been possible to discuss all the matter given, but the discussions have been limited only by the information secured.

The first part of the report deals with the logging of 1912. It has been possible to treat the logging of this year at greater length than that of 1911. The statement of logging costs for 1910 which appears toward the close of the report will at least show how the cost of logging varies as to the "show" or the efficiency of the management.

Calendar Year 1912.

Character of Country.

The country logged during the year 1912 is mountainous, rough and badly broken up. The slopes in general are steep. No rock outcrops or cliffs were encountered. The streams are not of drivable size, but are so located as to make it unnecessary to pump water for the donkey engines any considerable distance. The cost of railroad construction as given later in the report will indicate the character of the country.

It is the policy of the logging superintendent to

bring the logging spurs close to the timber, unless the cost of constructing them is excessively high, or the operation of trains on them is clearly impracticable. Of course, other factors would influence him in deciding whether it was impracticable to build a spur line to get a body of timber. The steepness of the slopes, where it was possible to locate the railroad spurs so that the logs were yarded up-hill, did not materially affect the output of the yarders, but where the timber had to be moved down-hill it was a different matter.

Soil.

Sandy loam with a clay subsoil. Drains poorly, making it necessary for the Company to gravel-ballast the spur logging roads during the greater part of the year. Practically all the ballast used on the spurs had to be hauled a distance of three miles.

Scale Report, 1912.

Species	Scale ft. B. M.	No. of Logs	Contents of Average Log
Douglas fir	32,204,222	14,369	2241
Spruce	829,157	497	1667
Cedar	2,868,684	2,665	1076
Hemlock	1,886,065	2,501	819
Total	37,788,128	19,832	

No. of machine days- - - - - - - - - - - - - - - - 531
Av. scale per yarding day- - - - - - - - - - - - 151,797 ft. B.M.
" " " yarder per yarding day - - - - - 71,164 " "
" number of logs per yarder per yarding day- 37

Av. scale per log- - - - - - - - - - - - - - - - -	1,904
No. of cars loaded - - - - - - - - - - - - - - - -	5,099
Av, scale per car- - - - - - - - - - - - - - - - -	7,410
Cull and wood logs logged but not included in the above scale	495

Logs secured from old cutting and included in the above scale report -

Douglas fir - - -	1,091,027
Spruce- - - - - -	12,838
Cedar - - - - - -	69,088
Hemlock - - - - - -	156,255
Total -	1,379,208

Labor Cost of Logging, 1912.

Item of Cost	Total Cost	Cost per M ft.
Loading	$ 4268.40	$ .112
Yarding	28198.25	.746
Bucking	14444.65	.382
Felling	6374.30	.168
Railroad Operation	7202.50	.190
" Maintenance	7147.00	.188
Shop	8808.94	.233
Rollways or Landings	1156.55	.030
Pole Road Construction	627.00	.016
Spur Railroads	6590.13	.174
Moving Donkeys	1691.60	.044
Watching Camp	75.50	.002
Fighting Fire	93.15	.002
Moving Camp	141.45	.003
Picking up Steel	554.40	.014
Total Labor Cost	$87373.82	$2.312

Discussion of Labor Cost, 1912.

Loading: Logs from rollway to cars or trucks. Does not include the cost of clearing site for rollways, building rollways, raising gin poles, etc.

The following crew was used:

Engineer - - - - - - - $3.25 per day

Fireman - - - - - - - $2.75 per day
Head Loader - - - - - 3.75 " "
Second " - - - - - - 3.50 to $3.25 per day

The fireman cut the wood for the loading donkey and the wood for starting the fires in the roading or yarding donkeys, the latter machines being oil burners. One-half of the loading fireman's wages was charged against the loading, and one-half against the yarding. At times only one loader was charged against the loading, the second loading being done by the chaser, and so charged against the yarding. It cannot be stated just how much of the loading was done in this way, but it is safe to say that the amount was not large.

A gin pole, crotch line and grabs, and a double drum Willamette loading engine were used. With this rig the logs can be raised and moved from and to the cars at will, and has proved very satisfactory. When the logs contain 6, 7 or 8 M feet, it is necessary, to save the timber, to use slings instead of logging grabs, and, to lift the logs, to transfer the tail-hold from the base of the gin pole to the crotch line. As a general thing, the logs did not exceed 40 feet in length, and most of them ran about 32 feet in length.

Yarding: Stump to landing, including single and double-hauling. The scalers' wages are included in this heading.

The following crew was used:

Hook tender - - - - $5.00 to $6.00 per day

Head rigging man - -	$3.75 to $4.25	per day
3 Rigging men- - - -	3.00 to 3.50	" "
Sniper - - - - - - - -	3.00 to 3.25	" "
Chaser - - - - - - - -	3.00 to 3.25	" "
Whistle punk - - - -	2.50	per day
Engineer - - - - - - -	3.50	" "

At times it was necessary to use four instead of three rigging men besides the head rigging man, also an extra chaser and Tommy tender.

When double-hauling was in progress it was necessary to use the following additional men:

Engineer - - - - - - -	$3.50 per day
Chaser - - - - - - - -	3.00 to $3.25 per day

This addition of two men was sufficient for good roading "shows". At times a further addition of one chaser was necessary.

Bucking: Cutting trees into log lengths. Includes wages of head bucker and his assistant, and one-half the wages of the saw filer.

The wages paid the crew was as follows:

Head bucker - - - - - - - - - -	$3.75	per day
Buckers - - - - - - - - - - - -	3.25	" "
Assistant to head bucker- - -	3.00	" "

The head bucker has charge of the felling and bucking, and marks with the aid of an assistant the trees to be bucked and the log lengths. The timber is large and the country rough, making the work of bucking difficult and hazardous. It is difficult to get the buckers to cut the logs the proper length and buck them square-off, and the Company has found it profitable to use a head bucker and an assistant.

The log lengths are measured with a tape.

The shortest logs cut were 16 ft., but there were very few under 24 ft. A few 60-ft. logs were cut, and a number of 40-ft. logs. The logs averaged about 32 ft. in length.

During the year the Company averaged close to 3 sets of fallers and a little better than 16 buckers. In March there were 10 fallers and 16 buckers.

Felling: Includes one-half the wages of the saw filer. See "Bucking".

The following are the wages paid the fallers:

Head fallers - - - - - -	$3.75 per day
Second " - - - - - -	3.40 to $3.50 per day

Railroad Operation: Up to May 1, three locomotives were used - a 42-T Shay, a 28-T Climax, and a 22-T Baldwin; and during the remainder of the year two locomotives were used - a 42-T Shay and a 33-T Shay. The haul from the rollways to the dump averaged about 6 miles. The line (3 miles) between the dump and the camp (buildings) is practically a water grade, the 42-T Shay being able to handle 18 loads over this portion of the road. The adverse grades on the 2½ miles of line between the camp and the siding at Spur 1 average 5½ per cent, the maximum grade amounting to 6 per cent. There are some 20° curves on this section of the line. The 42-T Shay pulls 4 empty flats from the camp to the siding. The heaviest grade on the spurs amounted to 9 per cent, and there were a number of sharp curves, one running 45°.

In addition to the locomotives enumerated, 20 flats (length 41 feet, capacity 80,000 pounds), and 6 sets of trucks were used.

Prior to May, the writer does not know how the trains were operated. After this date the 42-T Shay worked on the main line between the dump and the siding at Spur 1, a distance of about 5½ miles, and the 33-T Shay worked on the spurs. Of course, in the morning the 33-T Shay would move 4 empty flats from the camp to the siding or woods. The 42-T Shay averaged 4 or 5 trips per day between the dump and the siding at the camp, and roughly twice as many trips between the siding at the camp and the siding at Spur 1. The method was as follows:

Four empties, camp to siding; four loads, siding to camp; another similar trip from the camp to the siding; then eight loads, camp to dump.

The train crew, including the conductor and brakeman, with the assistance of the landing man unloaded the logs with log jacks. It never took less than 25 minutes to unload eight loads, and sometimes it required as much as an hour. This had the effect of reducing the working capacity of the locomotive considerably.

The writer is not able to discuss the method of handling cars from the rollways to the siding at Spur 1. However, without a knowledge of the grades and curves, the working distances, and time lost at the rollways, this information would be of little value.

The train crews were as follows:

42-T Locomotive:

Engineer - - - - - - -	$5.00	per day
Conductor- - - - - - -	4.25	" "
Brakeman - - - - - - -	3.75	" "

33-T Locomotive:

Engineer - - - - - - -	$4.50	per day
Conductor- - - - - - -	4.75	" "
Brakeman - - - - - - -	3.75	" "

The difference in the wages paid does not suggest the relative importance of the work, but rather length of service with the Company.

The locomotives burned oil.

Railroad Maintenance: Labor, cost of keeping all railroads in good condition as to surface and alignment, re-repairing trestles, keeping ditches open, taking care of slides, hauling and digging gravel, after the roads have been put in operation. It includes the upkeep of about 6 miles of track. The cost of maintenance varies greatly, hence this figure is of little value. The condition of the tracks at the beginning of the year cannot be given. It can, however, be stated that during the greater part of the year all tracks had to be ballasted with gravel, the gravel being secured from the bed of a river with a power scraper and hauled a maximum distance of about 3 miles. There are a large number of cuts and fills and the formation is such that slides are frequent.

The section foremen are paid $3.50 per day; the hands, $2.50 per day.

Shop: Labor, cost of repairing railroad motive power, rolling stock, donkey engines, rigging, blocks and hooks, tools, the making of some new equipment, and miscellaneous work.

It has been stated that up to the first of May three locomotives were in commission; after that date, two.

It is impossible to give the donkey engine days on logging, chunking-out, grading, rollway construction, gravel digging, loading, pile driving, etc.

The following machines were used during some part of the year:

One - 10" x 13"
" - 10" x 13"
" - 10" x 13"
" - 10" x 13"
" - 11" x 13"
" - 11" x 13"
" - 9½" x 11"
" - 9" x 10"
" - 8½" x 10"
" - 7" x 9"

Three yarding and three loading donkeys were used until the first of April, and after that date only two. During a part of the year double-hauling was done, and two machines were used frequently as roaders at the same time. Donkeys were used to clear right-of-way and grade, get out gravel, and drive piling for the new main line, hence a part of this cost should not be charged to the 1912 logging. This amount, however, is not considerable.

The regular shop crew is as follows:

Blacksmith - - - - - - - -	$5.00	per	day
" helper- - - -	3.50	"	"
Machinist- - - - - - - - -	5.25	"	"
" helper - - - -	3.25	"	"
Car tinkerer - - - - - -	3.25	"	"
Carpenter- - - - - - - - -	3.50	"	"
Second carpenter - - - -	3.00	"	"
Rigging man - - - - - - --	3.40	"	"

Rollways: Labor, cost of building eight rollways, which is at the rate of $135 per rollway. This cost includes the labor for clearing site, building rollway, raising gin poles, digging settings, putting rigging on gin poles, including, in fact, everything except the moving and setting of donkeys.

Pole Road Construction: Includes the labor cost of building pole roads. It is not possible to give the length or character of roads built. In general it can be said that they are not pole roads in the true sense of the word, being little more than fenders and bridges thrown in at particularly bad places.

Logging Spurs: Labor cost of clearing right-of-way, grading, laying, and ballasting track with gravel. It is not possible to give the total length of these spurs. Three pieces of spur road, amounting to 6,800 feet, were built for $5,448, which is at a rate of $4,225 per mile.

Moving Donkeys: Labor cost of moving all donkeys, camp to woods, one landing to another; in fact, the moving of all donkeys used directly in logging.

Watching Camp: Labor cost, watching camp during shut-downs.

Fighting Fire: Labor cost, fighting fire.

Moving Camp: Labor cost, moving 10 buildings 1½ miles.

Additional Sums Paid Out for Labor, 1912.

Cook house	$3249.70
Commissary	1498.80
Surveying (main and spur lines)	771.05
Buildings	497.80
Surfacing (surfacing and ballasting main line)	3355.00
Grading (main line)	5738.35
Structures on new main line	1912.22
Cruising	90.10
Siding #1	29.30
Revetment (part construction, main line)	1024.95
Main line #1 (betterment)	554.40
Hog pen	13.00
Topography	131.50
New Camp (construction)	121.40
New Camp Site (clearing site)	1329.00
Total	$20316.57

Discussion of Additional Sums Paid Out for Labor in 1912.

Cook House: Labor cost for cooks, flunkies, and bull cook. Inasmuch as the feeding of the men is so conducted as to show no deficit, no part of this amount is chargeable against the logging.

Commissary: Labor cost of running the commissary, which amount is charged against the commissary. The commissary, for the year showed a profit, and so none of this sum is chargeable against the logging.

Surveying: Labor cost of surveying on new main line and spurs. It could not be determined how much was spent on spur line surveying for the year, and so one-half is included in the following statement as being properly chargeable against the logging for the year.

Buildings: Labor cost of constructing new buildings or repairing old ones; it could not be determined which. Rent for the bunk houses is charged to the cost of feeding the men. The maintenance of the bunk houses is handled in the same way. Since the Company conducts the cook house department so no deficit results, these amounts are not properly chargeable against the 1912 logging. To be safe it has been included in the following statement:

Surfacing: Labor cost for surfacing and ballasting an extension of the main line road, not used during the year.

Grading: Same as "Surfacing".

Cruising: Labor cost of cruising some timeer on an adjoining tract, which is not properly chargeable against the 1912 logging.

Siding #1: Labor cost of building siding. The cost should at least be pro-rated over 2-years' logging, but the total is included in the following table.

Revetment. This improvement on the main line was not made until the last month of the year, and no part of the cost is included in the following statement.

Main Line #1: Labor cost of improving the main line. The cost should be pro-rated over several years' logging, but, since the amount is small, no part of it is included in the following statement.

Hog Pen: Not chargeable against the 1912 logging.

Topography: The same as above.

New Camp Construction: The same as above.

New Camp Site: The same as above.

Additional Labor Cost of Logging, 1912.

	Total Cost	Cost per M feet.
Surveying	$336.00	$.010
Buildings	497.60	.013
Siding #1	29.50	.007
Total	$913.10	$.030

Scale of Wages in Effect at Camp 1, January 1, 1912.

Machinist	$5.00	per day
Blacksmith	4.50	" "
" helper	3.25	" "
Carpenter	3.40	" "
Filer	3.60	" "
Head faller	3.60	" "
Second "	3.40	" "
Locomotive Engineer	3.00m	" "
Head Loader	4.50	" "
Second "	4.00	" "
Third "	3.50	" "
Loading Engineer	$2.75 to 3.00	" "
Hook tender	4.75 to 5.25	" "
Head rustlers	3.40	" "
Second "	3.15	" "
Chasers	3.15	" "
Rollway men	3.15	" "
Snipers	3.00	" "
Donkey Engineers	$3.25 to 3.60	" "
" Firemen	2.75	" "
Wood buckers	2.50	" "
Signal boys	2.25	" "
Swampers	$2.75-to 3.00	" "

Cost of Supplies and Small Equipment, 1912.

Items	Total Cost	Cost per M ft.
Engineering Supplies	$ 12.64	$.0003
Track and Grading Tools	475.89	.0120
Fuel Oil	6463.84	.1710
Sand Account	28.50	.0007
Water Works Supplies	202.80	.0050
Office Supplies	36.00	.0009
Oil and Grease	1050.91	.0270
Packing and Waste	233.59	.0060
Shop Supplies	1144.12	.0300
Shop Tools	64.83	.0010
Nails	55.07	.0010
Pipe Fittings & Valves	497.12	.0130
Wire Rope	8674.80	.2290
Rigging	2417.00	.0640
Blocks and Hooks	909.37	.0240
Fuel Oil Supplies	305.00	.0080
Powder Account	1866.01	.0480
Tools	711.36	.0180
Carpenter Tools	33.01	.0008
Lumber	164.79	.0040
Total Cost	$25366.65	$.6637

Discussion of Supply and Small Equipment Cost,

Camp 1, Washington, 1912.

Engineering Supplies: Supplies for engineering department, such as steel tapes, drafting paper, tacks, rods, repairs for instruments, blueprinting, etc. It also includes a slight depreciation on engineering equipment.

Track and Grading Tools: Account includes shovels, picks, grubbing hoes, track jacks, lining bars, rock hammers, spiking malls, claw bars, donkey scrapers, drill steel and sledges and axes used in track laying and grading. Shovels and picks used in the logging department were charged against this account. The total cost amounted to $475.89 or $.012 per

M feet.

Fuel Oil: Includes all fuel oil covered by invoices. At the close of the year oil was burned in the two locomotives, and the donkey engines used directly in getting logs out of the woods. This was not true of the early part of the year. Since installations were made at different times during the year, it is impossible to make this cost mean anything.

Sand Account: Includes the cost of sand for locomotives.

Water Works Supplies: Includes supplies for the maintenance of donkey and railroad water tanks, steam pumps, pump boilers, and all equipment of like nature.

Office Supplies: Supplies used in the office, such as pencils, stationery, payroll sheets, account books, and similar supplies.

Oil and Grease: Includes the cost of oil and grease used on locomotives, cars, trucks, donkey engines, etc.

Packing and Waste: Includes the cost of packing and waste used on the several machines.

Shop Supplies: Includes the cost of supplies bought for the shop, such as coal, iron, steel, etc.

Shop Tools: Includes the depreciation and supply charge on small tools, such as hammers, machine files, lathe tools, drills, etc.

Wire Rope: Includes the cost of main line, trip lines and main loading lines.

Rigging: Includes the cost of all rigging, such as chokers, tag lines, yarding lines, crotch lines, etc.

Blocks and Hooks: Includes the depreciation charge and the cost of repair parts on blocks and hooks.

Fuel Oil Supplies: Includes the cost of supplies used in the up-keep of oil tanks, oil cars, pumps, and other equipment used in the distribution of oil.

Powder: Includes the cost of powder used in clearing right-of-way and rollway sites, grading, and blasting in the woods.

Tools: Includes the cost of tools other than track, shop and carpenters' tools.

Lumber: Lumber used in the up-keep of camp buildings and flat cars.

Miscellaneous Cost, Camp 1, Washington, 1912.

Items	Total Cost	Cost per M ft.
Freight	$3836.18	$.101
Telephone Messages	8.25	.0002
Charity	37.22	.001
Total	$3881.65	$.1021

It is not known what freight is included under this heading. It possibly includes cook house and commissary supplies as well as logging supplies.

Cost of Repair Parts and Depreciation, Camp 1, 1912.

Items	Total Cost	Cost per M ft.
Track Equipment	$1437.04	$.038
Houses and Equipment	430.71	.012
Donkey Engines	1448.20	.038
Rolling Stock	1150.02	.034
R. R. Motive Power	2219.21	.06
Total	$6685.18	$.182

Discussion of Above Statements.

Track Equipment: The amount, $1437.04, is made to include wear and tear on steel, track bolts, spikes, rail braces, nut locks, tie plates, angle bars or fish plates, etc. It may be that the reckoned depreciation is not large enough. The data secured is as follows:

Inventory value, Jan. 1, 1912,	$32,236.77
Purchase during the year,	4,150.10
Total,	$36,386.87
Inventory value, Jan. 1, 1913,	34,949.83
Balance	$1,437.04

Houses and Equipment: This item of cost includes the wear and tear on camp buildings other than those rented, cook house equipment, and bunk house equipment, made up as follows:

Cook and bunk houses	$83.16
Cook house equipment	198.00
Shop plant	115.68
Bunk house equipment	33.01
Total	$429.85

Inventory Value, January 1, 1913.

Cook and bunk houses	$1202.24
Cook house equipment	735.90

Shop plant- - - - - - - - -	$1061.77
Bunk house equipment- - -	484.95
Total- - - -	$3484.86

Cook and Bunk Houses: Two-thirds of the buildings were old. Whether $83.16 is sufficient depreciation depends on how much has been paid off in past years.

Cook House Equipment: The equipment is sufficient for 140 men. The depreciation, $198.86, is a little more than the cost purchases for the year - $137.63.

Shop Plant: Includes the building and equipment. Estimated depreciation amounted to $115.68 and the equipment purchased during the year amounted to $494.95.

Bunk House Equipment: Steel bunks and mattresses are used. Depreciation amounted to $7.20, and new equipment purchased during the year amounted to $85.00.

It may be that wear and tear on the bunk and cook houses, bunk and cook house equipment, should not be charged against the logging. It is the aim of the management to make sums paid by the men for board take care of depreciation and maintenance on this property. Last year in following this plan the cook house books showed a deficit.

Donkey Engines: Here is included depreciation on the equipment and the cost of extras and supplies. For the number and size of engines see discussion of camp labor. It is difficult to throw any light on this item as it seems that the equipment and extras were not segregated. The data secured by the writer is as follows:

Inventory value, January 1, 1912,		$26,742.99
Purchased during year,		1,202.57
	Total	$27,945.56
Inventory value, January 1 1913,		26,497.36
	Balance	$ 1,448.20

Rolling Stock: Includes depreciation on equipment and extras for their upkeep. For a description of equipment see discussion of shop labor. The data secured is as follows:

Inventory value, January 1, 1912,		$22,586.52
Purchased during year,		6,275.12
	Total	$28,861.64
Inventory value, January 1, 1913,		27,711.62
	Balance	$ 1,150.02

Motive Power: This item includes depreciation on the locomotives and extras for their up-keep. For a description of equipment see discussion of shop labor. The data secured is as follows:

Inventory value, January 1, 1912,		$10,093.83
Purchased during year,		6,244.91
	Total	$16,338.74
Inventory value, January 1, 1913,		14,119.53
	Balance	$ 2,219.21

One second-hand 45-T Shay, in good condition, was purchased during the year.

Summary Logging Cost, Camp 1, Washington, 1912.

I t e m s	Total Cost	Cost per M ft.
Labor	$87,373.82	$2.3100
Supplies and small equipment	25,366.65	.6709
Miscellaneous cost	3,881.65	.1021
Management expense	2,456.70	.065
Right-of-way rental	1,889.40	.05
Repair parts and depreciation	6,685.18	.182
Driving and booming	17,004.60	.45
	$144,658.00	$3.8290

It will be noted that this statement does not include any allowance for building the main railroad. This is also true for the summaries of cost for 1910 and 1911. At the close of the year the main line tapping the timber logged during the year was approximately 5½ miles long. The cost of building this line is discussed in other parts of this report. Eighty million feet had been transported over the first three miles of main line and 37,788 M feet had been hauled over the remainder, at the close of the year. Two hundred million feet will eventually be hauled over it, resulting in a rather low cost per M feet. Statement does not provide for a tie cost.

The salary and board of the foreman, timekeeper, bookkeeper and engineer are pro-rated over the several steps of the operation. It seems that in the case of the bookkeeper and timekeeper the charge is made against the cook house. It may be that all the salary of the engineer is not covered in this, but any part that is not would not be considerable. The salary and traveling expenses of the superintendent and of board of superintendent, paymaster, and general superintendent, while in camp, could not be determined, and for the purpose of making the cost summary complete it has been assumed that the cost of this department was equal to the cost of 1911.

The statement does not provide a salary for the paymaster and general manager.

Calendar Year 1911.

Logging Conditions.

At the beginning of the year 1911, no timber was opened up except two small tracts in Section ___, one of which had to be roaded and yarded a maximum distance of approximately 7,500 feet, and the other a maximum distance of 4,000 feet, both bunches being moved down-hill. It was recognized that the logging of this timber would be expensive, but as the amount was small - it cut out 2,536,024 feet - it was not practicable to build a spur railroad to it. This timber, which we will refer to as the X-Brand timber, was large and of good quality, and it was hoped that a part of the stumpage value might be saved through logging it, even though it was a seemingly difficult "show".

On the Y Creek side, the railroad was within 2,000 feet of the nearest timber, which timber will be referred to as the Y-Brand timber. To get this timber, the railroad was extended 2,000 feet, and through the center of a dam which was constructed in the creek. The country benched out on top of the bluffs on each side of the canyon, and two yarders were set on the bluffs on each side of the canyon, and by this means the logs were kicked down chutes to the dam, later to be loaded from the water by a gin-pole loading rig. After the yarding shows were worked out, pole roads were constructed, and additional areas were logged by the roader-yarder method. Fully 60 per cent of this timber was double-hauled.

Total Output of Camp 1, Washington, 1911.

Kind	No. Logs	Scale ft. B. M.
#1 Douglas fir	105	328,296
#1 " "	706	2,390,819
#2 " "	841	1,773,795
#2 " "	5887	13,290,049
#3 " "	85	112,330
#3 " "	2389	2,847,978
Hemlock	1766	1,333,355
"	655	535,756
Cedar	687	488,991
"	3303	2,313,517
Spruce	671	1,190,622
Total	17094	26,605,508

Av. contents of all logs	1,556 ft.	B.M.
Av. " " Douglas fir logs	2.071 "	"
Av. " " Hemlock logs	.772 "	"
Av. " " Cedar logs	.702 "	"
Av. " " Spruce logs	1.774 "	"

Labor Cost, 1911.

	Total Cost	Cost per M ft.
Logging Spurs	$7,686.50	.290
Breakwater	363.05	.013
Moving Camp	150.53	.006
Dam	471.15	.018
Surveying	628.88	.023
Shop	4,967.45	.187
R.R. Maintenance	4,099.05	.154
R,R. Operation	4,056.10	.152
Felling	8,328.40	.313
Bucking	12,166.75	.457
Yarding	29,431.95	1.106
Pole Road Construction	1,228.63	.046
Loading	4,040.00	.152
Total Labor	$77,618.44	$2.917

Supply Cost, etc., 1911.

	Total Cost	Cost per M ft.
Oil and Grease	$ 797.85	$.030
Transportation	2,128.19	.080
Roadbed	2,570.35	.096
General Expenses	1,412.48	.053
Tools	1,193.27	.045
Dam	74.14	.003
Donkey Engines	2,400.95	.090
Rolling Stock	1,609.53	.060
Landing	399.00	.015
Shop	2,331.88	.088
Gas Engines and Pumps	282.41	.011
Wood	737.10	.028
Fuel Oil	1,761.13	.066
Wire Rope	10,726.96	.403
Total Cost Supplies, etc.	$28,425.24	$1.068

Management Expenses, 1911.

	Total Cost	Cost per M ft.
(a) Salaries and board of foreman, bookkeeper, timekeeper and engineer	$5,714.60	$.215
(b) Salary and traveling expenses of Superintendent, and board of Superintendent, Paymaster and General Manager while in camp	2,456.70	.092
Total Management Expenses	$8,171.30	$.307

Right-of-Way Rental Charges, 1911.

	Total Cost	Cost per M ft.
Rental charges (annual)	$1,235.78	$.046
Special Right-of-Way	600.00	.023
Total	$1,835.78	$.069

Driving and Booming, 1911.

	Total Cost	Cost per M ft.
Driving and Booming (contract) --	$11,972.48	$.45

Logging Spurs: This item includes the labor cost of putting 9,435 ft. of right-of-way in shape for grading, at a cost of $1770, which is at the rate of about $1000 per mile (5200 ft., or about 5/9 of this piece of right-of-way was in a canyon, and very difficult to clear on account of the broken-up timber and the difficulty of disposing of the refuse); the grading of 4760 ft. of roadbed, which required the moving of 10,710 cubic yards of solid rock and earth in about equal proportions, at a cost of $2,195.55, or 20½¢ per cubic yard (this is at the rate of about $3,200 per mile); the construction of 760 ft. of stringer bridges at a cost of $418, or 56¢ per linear foot; the building of 2,035 ft. of 3-piling-bent trestle average height of 5 ft., with hewed cap and stringers, all of which material was yarded from along the track and included in the labor cost of the structures, at a cost of $2,792.45, or $1.37 per linear foot; the lifting and laying of 4,955 ft. of track at a labor cost of $550, which is at the rate of about $680 per mile.

Breakwater: The $365.05 for labor under this heading was for scattering gravel back of the breakwater and cleaning out the channel of the river for the purpose of protecting their main line railroad track.

Moving Camp: The $150.55 spent for labor is for moving ten buildings a distance of about 2 miles, preparing the

usual wooden foundations for these buildings, and laying about 1000 ft. of pipe line.

Dam: The labor cost of $471.15 was for building a dam 110 ft. long and 16 ft. high, which was of crib construction and faced with 3"x12" planking and 1"x8" battens. The total cost of labor and material for clearing site, building dam and putting up a gin pole loading rig amounted to $549.20.

Surveying: The labor charge of $628.88 represents the cost of doing 3 miles of preliminary and permanent railroad location, including the engineering work on the 3 miles of grade, etc., which is at the rate of $209.63 per mile.

Shop: The labor cost $4,967.45 and the material and supplies cost $2,331.88, or a total of $7,299.33. Under this is included the manufacture of rigging, the upkeep of donkeys, locomotives and cars and the repairing of any other equipment used in the camp. Two locomotives were used; one, a geared locomotive, hauled the logs, the other, a direct-connected locomotive, did the miscellaneous work about the camp, such as hauling men to the woods, the hauling of ballasts, ties, rails, etc., for railroad construction. Twenty flat cars, about three years old, were in use.

Railroad Maintenance: The labor cost of $4,099.05 was for the upkeep of about 5 miles of main and spur line railroad. It was considered high by the superintendent. During the year a considerable amount of ballast was placed under the

three miles of main line. The trestles on one of the spurs were poorly constructed and three or four men had to be kept on them all the time during the logging season. Two pit cattle guards were built, and some new ties were placed in the main line.

Railroad Operation: The labor cost of this work amounts to $4,056.05, and the superintendent was of the opinion that there was not another camp in this region that handled as many logs that year as his camp did with one locomotive, considering the mileage, which was about five miles.

Felling: The labor cost of this work amounted to $8,328.40, or 32-4/10¢ per M feet. This is really not the true cost, as at the beginning of the year no timber had been felled, while at the close of the year about 800,000 ft. had been felled and not logged, and the above figure is based on the amount logged. The actual cost was about 31-1/3¢ per M ft. The superintendent felt that this work cost too much.

Bucking: The labor cost of this work amounted to $12,166, or 45-7/10¢ per M ft. This was one of the most difficult departments to handle during the year. The country was extremely rough, the timber large and dense, and the trees, when felled, lay in such shape that the work of bucking was very hazardous. This made it difficult to hold men. Then it was hard to get the men to buck the logs square-off, and a head bucker to measure them correctly. About one month before the close of the year, the head bucker was required to use a

tape in measuring the logs, and an assistant was employed to help him with this work. At the close of the year about 500,000 feet were bucked, and not logged, and so were not included in the above cost. The difference, however, will amount to very little.

Yarding: The labor cost of doing this work amounted to $29,431.95, or $1.06 per M ft. No topographic map of the country logged during this year had been made, and it was not possible for the writer to so familiarize himself with the country as to make a discussion of this cost possible. The superintendent stated that the timber was yarded an average maximum distance of 2,000 ft. and that 60 per cent of it was double-hauled.

Pole-road Construction: It was not possible to determine the length or character of the pole roads constructed during this year.

Loading: The labor cost of this work amounted to $4,040, or 15-2/10¢ per M ft. Seventy-five per cent of the timber was loaded from the dam to the cars.

Oil and Grease: This cost amounted to $797.85, or 3¢ per M ft. It includes the oil and grease used on the locomotives, donkeys, engines, flat cars, etc., and oil used for illuminating the camp. It was not possible to determine the donkey engine days for the year, and so this figure is only of general value.

Transportation: The cost of freight on equipment and supplies shipped to the camp, which cost amounted to $2,128.19, or 8-2/10¢ per M ft. This figure may include the cost of food supplies and merchandise handled by the commissary. It was not possible to determine just what this cost includes.

Road Bed: The supplies and equipment under this head amounted to $2,570.35, or 10¢ per M ft. It is a rather erroneous segregation, as it is made to include rails, ties, track spikes, switching equipment and powder. It was not possible to determine the amount of the several items purchased.

General Expenses: It could not be determined what was included under this segregation.

Tools: The cost for the year amounted to $1,193.27, or 4½¢ per M ft. Under this heading are included all the tools used in the camp.

Donkey Engines: It seems that under this head is included the cost of repair parts, amounting to $2,400.95, or 9¢ per M ft. The writer, however, was not able to satisfy himself as to what is really included under this head.

Rolling Stock: Under this head it seems is included the cost of repair parts for the locomotives and flat cars, but here, as in the case of the item "donkey engines", it could not be determined satisfactorily what was really included. One geared engine was employed hauling logs, and one direct-connected locomotive did miscellaneous work about the camp. Flat cars

numbering twenty, three years of age, were used.

Gas Engines and Pumps: Cost of oil, supplies and repair parts for this equipment. The number and time they were used could not be determined.

Wood: The cost of labor used to cut fuel wood for the locomotive doing miscellaneous duties about the camp.

Fuel Oil: The total cost of this oil amounted to $1,761.13, or 7¢ per M ft. About $400 worth of oil was used on a donkey engine, and the balance was used on the Shay Locomotive that hauled the logs. Putting it another way, $1,361.13 worth of oil was burned on the geared locomotive hauling the logs, which was a rate of a little over 5¢ per M ft.

Wire Rope: The total cost of this material amounted to $10,726.96, or 40-3/10¢ per M ft. Used Broderick & Bascom Yellow Strand 1⅛" main line, also tried out three of their 1¼" plow steel lines. Fair results were secured with the Yellow Strand, and poor results from the plow steel. The superintendent felt that this cost per M ft. was too high.

Management Expenses: The salary of the superintendent was divided between this camp and another. He worked for two other camps and the amount received for this work was credited to the business, so in a way his salary was pro-rated against four camps. The same thing is true with his traveling expenses. This cost does not include salaries of the paymaster or General Manager; only their expenses while traveling

to and from the camp and when in the camp.

Total Cost of Logs - Camp 1, 1911.

	Total Cost	Cost per M ft.
Labor	$77,618.44	$2.917
Supplies	28,425.24	1.068
Management	8,171.30	.307
Right-of-way	1,835.78	.069
Driving and Booming	11,972.48	.450
Total Cost of Logging	$128,023.24	$4.811

New Main Line Construction, Camp 1, 1911.

Surveying: Three miles of main line located, two miles of which represented finished road bed as it relates to surveying, at a cost of $807.82.

Center and grade stakes were run on 3.33 miles of main line at a cost of $135.50.

Clearing Right-of-way: Two miles of way was chunked out and cleared at a cost of $2,134.60, or $1,067.30 per mile.

An additional half-mile of way was felled, bucked and swamped at a cost of $200.

This line traversed very rough country that had been partially logged some years before, making it difficult to move donkey engines. This resulted in rather expensive work. One-half the cost of moving the donkey engine from one scraper out to another was charged against the grading.

Grading: Two miles of line was graded at a cost of $8,885.05, or $4,442.52 per mile; 52,285 cubic yards of loose rock, soap stone, earth and solid rock were moved for this

amount, or at a rate of 17¢ per cubic yard. This was power scraper work. One-half the cost of moving the donkey engine from one cut to another was charged against the grading, and the other half was charged against the cost of clearing right-of-way.

Structures: The cost of four trestles, Nos. 3, 4, 5 and 6, amounted to $1,478.18. They occur on 1-1/3 miles of line, which is at the rate of about $1,110 per mile. This cost includes the cost of yarding the material to the sites, but does not include the value of the material, or a rental on the machine.

Bridge #3 is a framed structure; 120 ft. long; maximum height, 27 ft.; built of cedar posts, hewed sills and caps and sawed stringers.

Bridge #5 is a framed structure of complicated cripple-bent construction; 160 ft. long; maximum height, 35 ft.; Douglas fir and cedar sills, hemlock posts and caps, and sawed stringers.

Bridge #6 is a pile-bent trestle. It was built entirely of hewed hemlock with three piling to a bent. It is 110 ft. long and cost $3.29 per linear foot.

Average Cost per Mile of Main Line, Camp 1, 1911.

Surveying - - - - - - - - -	$269.27
Clearing right-of-way - -	1067.30
Grading - - - - - - - - - -	4442.52
Structures- - - - - - - - -	1110.00
Total cost per mile, ready for ties and steel-	$6889.09

Average Wages Paid at Camp 1, Washington, by Months, During the Calendar Year 1911.

The average wage per day per man was $3.106.

The average wage per day per man by months is as follows:

January - - - - - - -	$3.46
February- - - - - - -	3.313
March - - - - - - - -	3.19
April - - - - - - - -	3.216
May - - - - - - - - -	3.154
June- - - - - - - - -	3.16
July- - - - - - - - -	2.892
August- - - - - - - -	2.90
September - - - - - -	2.95
October - - - - - - -	2.98
November- - - - - - -	2.96

The following is a comparative statement of the logging costs at Camp 1, Washington, for the calendar years 1910 and 1911. The discussion of the several segregated costs for 1911 give all the information it is possible to give for the segregations of 1910, but in view of the fact that the statement was prepared by the management, the discussion is possibly ample insofar as it indicates the character of the expenditures as segregated for 1910.

It is not possible for the writer to discuss the logging of 1910. The methods were the same, also most of the equipment. The railroad haul during 1910 was a little shorter than in 1911, but not enough to speak of. The character of the country and timber in a general way were quite similar. A new superintendent was employed during 1911, which may explain the reduced cost of logging during this year.

Comparative Statement Logging Cost, Camp 1, Washington, 1910-11.

Output 1910 — 16,721,719 ft. B.M.
" 1911 — 26,605,508 " "

Item	Total Cost 1910	Cost per M ft.1910	Total cost 1911	Cost M ft. 1911
Logging Spurs	$ 8,742.30	$0.523	$7,686.50	$.290
Breakwater	1,831.85	.105	363.05	.013
Moving Camp			150.53	.006
Dam			471.15	.018
Surveying	88.05	.005	628.88	.023
Shop	4,344.75	.261	4,967.45	.187
R.R. Maintenance	5,775.80	.346	4,099.05	.154
R.R. Operation	7,654.20	.459	4,056.10	.152
Felling)			8,328.40	.313
Bucking)	18,436.60	1.104	12,166.75	.457
Pole Road Construction			1,228.63	.046
Yarding	33,347.35	1.995-	29,431.95	1.106
Loading			4,040.00	.152
Landing	1,985.35	.110	399.00	.015
Tank Foundation	111.45	.007		
Fire	201.80	.012		
Oil and Grease	668.55	.040	797.85	.030
Transportation	2,489.48	.150	2,128.19	.080
Road Bed	2,468.24	.149	2,570.35	.096
General Expense	886.51	.053	1,412.48	.053
Tools	1,274.18	.076	1,193.27	.045
Dam			74.14	.003
Donkey Engines	1,677.42	.101	2,400.95	.090
Rolling Stock	1,757.69	.106	1,609.53	.060
Shop	2,429.77	.146	2,331.88	.088
Gas Engines and Pumps	288.34	.017	282.41	.011
Wood	1,158.76	.069	737.10	.028
Fuel Oil	1,696.79	.120	1,761.13	.066
Wire Rope	8,277.24	.495	10,726.96	.403
Telephone	36.68	.002		
Salary Timekeeper)				
Bookkeeper)				
Foreman)	5,448.00	.327	5,714.60	.215
Supt.Salary & Exp.	200.00	.012	2,456.70	.092
Right-of-way	1,785.00	.108	1,835.78	.069
Driving & Booming	7,524.77	.450	11,972.48	.450
	$122,586.72	7.348	128,023.24	4.811

Decreased logging cost in 1911 over 1910 - 2.537

Cost of Logging, Camp 2.

The following report deals with the cost of logging at a camp in Western Oregon during the calendar year 1912. The facts given indicate that it is a rather large operation. Practically all the information was taken from the books or records of the Company and all the data can be relied upon. It has not been possible to give the total cost of logging for the year, or to discuss all the segregated costs in a satisfactory manner. This, however, is to be expected, and the condition that makes it impossible to secure what might be termed satisfactory cost data will obtain for a long time to come. However, the expression "satisfactory cost data" is relative. The record of yarding for the year is thought to be highly satisfactory.

Topography and Surface: Two maps are included with this report, each showing a part of the country logged by the Company during the calendar year 1912. Where possible, the rollways are indicated and the yarding shows bounded. These maps indicate that the country is quite flat and not badly broken up. None of the timber was double-hauled and the average maximum yarding distance was about 800 feet. This, taken into consideration with the fact that the spur railroads were located in practically the most advantageous manner from the standpoint of yarding without necessitating maximum grades of over 5 per cent (most of them were less than 4 per cent), gives

a good idea of the topography of the country.

It should be stated that the cost of grading the spur railroads is below the average. The surface of the country is smooth, no rock outcrops are encountered, and little down timber and brush have to be contended with. There are no streams of any size and frequently it is necessary to pump water two or three thousand feet to the yarding donkeys.

Soil: The soil drains poorly, making it necessary to rock ballast most of the spur railroads during a large part of the year. The ballast has to be hauled up-grade two or three miles.

Character of Forest: The forest is about 150 years of age. It is yielding about 80 M ft. per acre, the trees averaging about 28" D.B.H. Possibly 95 per cent of the stand is Douglas fir, the balance hemlock. Practically no defective timber is encountered.

Accessibility: The average railroad haul from the rollways to the dump is about 4 miles. The first 3 miles of this - dump to camp - we may call the main line haul, and the remaining 1 mile of haul - camp to rollways - we may call the spur railroad haul. The grade on the main line, with the exception of a short distance, is favorable, averaging about 4 per cent. In places the favorable grades on the main line amount to more than 4 per cent, running as high as 8 per cent for a short distance at one point. There is about 700 ft. of adverse grade on the main line which averages about 4 per cent.

It is this piece of line that fixes the number of cars that can be hauled from the camp to the dump at a trip, as no more empty trucks can be hauled from the landing to the camp than can be hauled loaded from the camp to the dump over the adverse grade of 4 per cent. A 45-T geared locomotive - a Shay - works between the camp and dump, hauling 6 loads at a trip, and making as a rule about 6 trips per day. The spur railroad haul, of course, varied, but the average haul was about one and one-half miles. It has been stated that the grade on the spur lines did not exceed 5 per cent and that most of them were less than 4 per cent, and it is thought that none of the adverse grades amounted to more than 4 per cent. A 45-T Climax worked on these lines between the rollways and the camp, bringing in three loads at a trip as a general thing.

Scaling: The logs are scaled three times: (1) by the camp scaler, (2) by the river scaler, and (3) by the mill deck scale. The costs per M ft. given in this report are based on the camp scale. Referring to the output from Yarders 1 and 2: the river scale overran the woods scale by about 1 per cent, and the mill deck scale overran the woods scale by 11 per cent. The size and character of the timber has been dealt with. In this connection it should be stated that the timber was practically free of defect of any kind.

Management, Organization, Care of Men: The camp is in charge of a superintendent who divides his time with three other camps of about the same size. This official spends about

one week per month in this camp, generally at one time. Directly in charge of the camp is a foreman. The following men are responsible to the foreman for the several steps of the operation:

Head bucker	Boom master
Hook tenders	Section foreman
Head loaders	Logging engineer
Brakemen	Blacksmith
Master mechanic	Bookkeeper
Timekeeper	Cook

All the men are employed by the superintendent or foreman, but anyone in charge of a division of the work has authority to discharge members of his crew.

The head bucker is responsible to the foreman for the felling and bucking of the timber.

The hook tenders have charge of the yarding crews, including the engineers, firemen and woodbucks.

The head loaders are in charge of the loading crews, including the loading engineers and firemen.

During the year a bonus of $25 was given to the hook tender who got out the largest scale during the month (the hook tender did as he pleased with this sum, and as a rule none of it found its way to his men); and a bonus of $15 was given to the loading crew that handled the largest scale during the month, $10 to the head loader and $5 to the second loader. This bonus system did not prove very satisfactory and this year the Company is trying out another. A certain sum per M ft. for every foot over an average of 85 M ft. per yarder per yarding

day is divided among the men employed in yarding, loading and hauling.

The men live in small bunk houses (12'x24'), built on skids. These houses are equipped with four double steel bunks, mattresses, etc., and are lighted with electric light. These houses cost about $100.

The cook house and dining room is 30'x120'. It is well built, well lighted, and relatively pleasing inside and out. Eight men are seated at a table. These cook houses cost about $1200.

The store, from the standpoint of structure, equipment and stock, is as good as is usually found in villages having a population of 600.

The Company is providing cottages of three and four rooms for the married men.

The foreman's salary is pro-rated against the several steps of the operation. The same thing is done with one-half the timekeeper's salary. The bookkeeper's salary and one-half the timekeeper's salary is charged against the store.

The cook is paid a certain sum of money for furnishing all the labor used in preparing and serving the food. He decides on the help necessary, employing and dismissing it as he thinks best.

The following is a record of the work done at Camp 2 during the calendar year 1912, with three yarders. No logs were double-hauled, and the average maximum yarding distance

amounted to about 800 ft. The yarding "shows" from the standpoint of the ground were for the most part as good as can be found in this region. Seldom if ever was the ground steep enough to cause the logs to run. Not less than two logs were yarded at a turn; sometimes three or four, and occasionally as many as five. The yarders were up-to-date in design, in good repair, and were driven at practically their highest speed. During a part of the year, two of the yarders burned oil.

Yarders Nos. 1 and 2 handled longer logs than yarder No. 3, which was due to the fact that the Company was logging their own timber with the first two machines, and converting their output into lumber at their own mill. Logs as long as 90 feet were yarded by these yarders, the average lengths amounting to about 60 ft. Yarder No. 3 was working in timber owned by Mr. X, who paid the Company a stipulated sum for yarding, hauling and rafting; in fact, for all steps of the logging operation except the felling and bucking. In accordance with the terms of the contract entered into by Mr. X and the Company, the logs were not to be cut longer than 40 ft. Mr. X's logs averaged about 32 ft. in length.

The average output per yarder per yarding day is as follows:

Yarder	#1 - - - - - - - - -	83,677 ft.
"	#2 - - - - - - - - -	81,696 "
"	#3 - - - - - - - - -	66,220 "

The average number of logs per yarder per yarding day is as follows:

Yarder	#1	118
"	#2	113
"	#3	140

The volume of the average log by yarders is as follows:

Yarder	#1	705 ft.
"	#2	721 "
"	#3	469 "

The three yarders were of the same size, make and age; the "shows" from the standpoint of timber, ground and maximum yarding distances were practically the same. The average daily output of yarder #1 and yarder #2 was practically the same, both from the standpoint of the amounts in logs and the amounts in feet. The output per yarding day from yarder #3 was about 15 M ft. less than the daily output from yarder #2, and about 17 M ft. less than that from yarder #1. While it cannot be said that this difference in the output is entirely due to the size of the logs, - the factors, of course, were not exactly the same, - it is quite clear that the difference is due for the most part to this fact.

Labor Cost, Output from Yarders Nos. 1, 2 and 3, Based on 50,300 M feet, Log Scale, Camp 2, Oregon, 1912.

Item	Total Cost	Cost per M ft.
Yarding	$34,700.00	$.690
Felling ° 38,454 M ft.	11,368.00	.295
Bucking ° 38,454 M ft.	8,719.00	.227
R. R. Operation	13,810.00	.275
R. R. Maintenance	13,481.00	.268
Shop, R.R. Rolling Stock	6,166.00	.122
Shop, Logging Equipment	2,904.20	.058
Rollway Construction	4,514.00	.090
Attending Supply House	1,379.00	.027
Landing, Maintenance	175.00	.003
Loading	10,898.00	.217
Watching Fires	106.00	.002
Blasting Stumps in Woods	826.00	.016
Moving Yarding and Loading Donkeys	1,737.00	.035
Booming and Rafting	4,392.00	.087
Sand	401.00	.008
Maintenance, Booming and Rafting Grounds	109.00	.002
R. R. Construction	14,226.75	.283
Pumping Water to Yarders, Loaders, etc.	1,031.85	.021
Total	$130,943.80	$2.726

°The Company felled and bucked only the timber handled by Yarders Nos. 1 and 2.

Discussion of Labor Cost, Camp 2, Oregon, 1912.

With the exception of two items - felling and bucking - the cost per M ft. is based on 50,300 M ft, the output from Yarders Nos. 1, 2 and 3. The total cost of felling and bucking includes only the timber handled by Yarders Nos. 1 and 2 - 38,454 M ft. All of the foreman's salary and one-half the timekeeper's salary are pro-rated against the several items of cost.

Yarding: Stump to rollway, including the cost of changing ends. It does not include the cost of moving donkeys from one rollway to another, the taking in and putting out of lines when a move is made, the digging of donkey settings, or the raising of gin poles and the slinging of loading rigging. It includes the wages of all the men up to the loaders, including the wages of the scaler. The yarding crew was as follows:

Hook tender	$6.00 per day
Rigging man	4.00 " "
" "	3.50 " "
" "	3.25 " "
Sniper	3.00 " "
Chaser	3.25 to $3.50 per day
Whistle punk	2.50 per day
Tommy tender	3.25 " "
Fireman	2.75 " "
Wood chopper	2.50 " "
Woodbuck	2.50 " "
Yarding engineer	4.00 " "
Log brander	2.50 " "

After July 4, two of the three yarders burned oil, which reduced the yarding crew by three men: fireman, woodbuck and wood chopper.

The number of men and the wages will, of course, vary a little. It is the policy of the management to use a butt chain block only when a tree roller will not do the work.

Felling: Labor, felling timber, including one-half the wages of the filer. The Company worked 8 sets of fallers on the average. The wages paid the fallers were as follows:

Head faller	$3.75 per day
Second "	3.50 " "

Bucking: Labor, cutting trees into log lengths, including the wages of the head bucker, buckers, and one-half the filer's wages.

The head bucker has charge of the felling and bucking, passes on the timber to be felled and bucked, and marks the log lengths. The wages paid were as follows:

Head bucker	$4.25	per day
Buckers	3.25	" "
Filer	5.50	" "

The company worked on an average of 16 buckers per day.

R. R. Operation: Labor cost. During the year three locomotives were operated. Two 45-T geared locomotives, a Shay and a Climax, hauled the logs, and a 24-T direct-connected Baldwin hauled the men to and from the work, supplies, ties, steel, oil, etc.

The Shay worked on the 3 miles of main line, hauling 6 loads to a trip, and making about 6 trips per day. The Climax worked on the spurs between the main line and rollways, an average distance of about 1½ miles. The grades on these roads are discussed under "Accessibility".

The three locomotives burned oil.

The train crews by locomotives were as follows:

Shay

Engineer	$5.00	per day
Fireman	3.25	" "
Brakeman	4.50	" "
"	3.75	" "

Climax

Engineer - - - - - - -	$5.00	per day
Fireman- - - - - - - -	3.25	" "
Brakeman - - - - - - -	4.50	" "

Baldwin

Engineer - - - - - - -	$3.25	per day
Fireman- - - - - - - -	2.75	" "

Average car load - 4,963 ft.

Total number of cars - 10,246.

Average number of cars to a train,(main line) - 6.

Average number of cars to a train (spur line) - 3.

Length of combined train - 110½ miles.

The track, main and spur, is kept in better condition as to surface and alignment than the average logging railroad.

No great amount of time is lost in uhloading, the unloading of a train of six loads being accomplished in about eight minutes on the average. A train is sometimes unloaded in five minutes. The working mileage per day of the Shay was about 30 miles; of the Climax, about 36 miles.

R. R. Maintenance Labor cost of keeping all railroads in good condition as to surface and alignment, keeping ditches open and taking care of slides. This item takes care of additional ballasting, including the train crew labor for hauling and the labor for digging the gravel. The total mileage taken care of at any one time did not exceed 5½ miles, and

so the total cost of this work seems excessively high. It can be stated, in the way of explanation, that the main line was used for the first time at the beginning of this year; that heavy side hill cuts are common, and that several rather large slides occurred.

Shop, R. R. Rolling Stock: Labor cost of the up-keep of four locomotives: a 45-T geared Shay, a 45-T geared Climax, a 35-T direct-connected Baldwin, a 24-T direct-connected Baldwin, and 33 sets of trucks. The 35-T Baldwin was wrecked during the early part of the year, resulting in its being used but a very short time. It is not possible to say how extensive the repairs were, but it is thought that no attempt was made to overhaul this locomotive during the year as this work was in progress in March, 1913. The Climax was of an early type, having very light driving shafts, and so much trouble resulted from broken shafts that the Company gave up using this locomotive in the early part of 1913. The up-keep of this locomotive was very high. An attempt was made to get data that would make a discussion of these costs by locomotives and trucks possible.

The regular shop force is as follows:

Blacksmith - - - - - - -	$5.00	per day
" helper- - -	3.25	" "
Mechanic - - - - - - - -	5.00	" "
Car tinkerer - - - - - -	3.25	" "

During a part of the year a mechanic's assistant was employed as well as a carpenter. Then, too, when a locomotive

was in the shop, the train crew assisted with the repairs. It should be stated that the blacksmith and his assistant spent a large part of their time in repairing logging equipment, which is included under the following item of expense. It is quite impossible to say what the average crew in the shop would have amounted to.

Shop, Logging Equipment: Labor cost for repairing yarding and loading engines, rigging, including blocks and hooks, tools, etc., also the making of some new equipment.

Rollway Construction: Labor cost of clearing site, building, raising gin poles, slinging loading rigging on gin poles, digging donkey settings, including, in fact, everything except the moving and setting of donkeys.

The total cost of building 29 rollways was $4,514, or about $155 per rollway.

Attending Supply House: Labor cost for taking care of and giving out oils, waste, tools, equipment, etc.

Dump Maintenance: Labor cost for the up-keep of dump.

Loading: Labor cost, loading logs from rollways to trucks. It does not include the cost of building rollways, raising gin poles, etc.

The following crew was used:

Engineer - - - - - - -	$3.50	per day
Fireman- - - - - - - -	2.50	" "
Head loader- - - - - -	5.00	" "
Second " - - - - - -	3.75	" "

The loaders burned wood, which was prepared by the

fireman.

A gin pole, crotch line and tongs, and a double drum Willamette loading engine were used. Loading grabs instead of tongs were used with the shorter logs.

Watching Fires: Labor cost, watching small fires set out by wood burning yarder.

Blasting Stumps in Woods: Labor cost, blasting stumps in connection with the yarding.

Moving, Yarding and Loading Donkeys: Labor cost of moving these engines from one setting to another. It includes taking in and putting out yarding lines, etc., but does not include slinging the loading rigging on the gin poles, neither does it include the "changing of ends".

Booming and Rafting: Labor cost of booming and rafting on the Columbia River. The work was done by six men ($3.25 per day) and a foreman ($3.50 per day and board). The logs were dropped in a small stream about 1000 ft. from booming grounds, and one of the above crew spent most of his time at the landing seeing that the logs were not unloaded, one upon another.

The fact that the Company was doing some contract work (logs handled by Yarder 3) made it necessary to sort and raft the logs by ownership. This made the work more expensive than it otherwise would have been. Then, too, the timber had to be sorted and rafted as to classes, saw timber and piling.

R. R. Construction: Labor cost of building nearly six miles of track (5 miles and 4950 ft., or 330 ft. less than

6 miles). One mile and 2100 feet of the track consisted of sidings (spurs into rollways). It is not quite true that 6 miles of track were constructed as 1550 ft. of track was not laid or surfaced. It was not possible to get the cost of this work by segregated parts, such as clearing right-of-way, grading, track laying, surfacing, etc.

The total cost of the work amounted to $14,226, or $2,370 per mile when based on 6 miles. It should be considered in connection with this cost that when the 4 miles and 2850 ft. of track proper were cleared, the sidings were practically cleared, little additional clearing being necessary. The same thing, to a lesser extent, is true of the grading. On the other hand, the one mile and 2100 ft. of siding consisted of 22 sidings, resulting in the putting in of many more switches than would ordinarily be installed with a track of this length. The total cost of trestle and bridge work amounted to only $246.

The total cost of clearing right-of-way amounted to $2,769, or about $460 per mile, based on 6 miles. If it is assumed that the clearing of the right-of-way for the spurs provides for the sidings, the cost per mile for clearing right-of-way would amount to about $600 per mile, based on 4 miles and 2850 ft. The construction engineer for the Company stated that in marking trees to be felled on the right-of-way, no additional trees were marked because a siding was going in. Trees 15 to 20 ft. on each side of the center line are felled, and

stumps seven or eight feet on each side of the center line are blown or pulled out. The cost of felling and bucking the timber standing on the right-of-way is charged against the cost of clearing the right-of-way.

The total cost of railroad construction includes the cost of raising track.

Additional Labor Costs, Camp 2, Oregon, 1912,
Based on 200,000 M ft., Log Scale.

Item	Total Cost	Cost per M ft.
Painting dwellings	$ 97.15	
Building Tool house	28.75	
Repairing dwellings	210.75	
Pumping water to camp	923.30	
Building donkey sleds (3, 40' long)	611.95	
Building shop annex	218.15	
Moving blacksmith shop	174.25	
Digging pits in shop	57.60	
Grading, laying and surfacing track into shop	150.75	
Unloading lumber	104.65	
Digging ditch around shop	14.00	
Building motor car house	13.00	
Repairing electric light plant	26.90	
Main line betterments	243.70	
Clearing additional camp site	17.50	
Painting and repairing boom cook house	22.30	
Covering water pipe	279.85	
Painting and putting up R.R. signs	36.75	
Building sand house	68.50	
Building platforms along R.R.	52.75	
Painting buildings	112.55	
Building water tanks	51.20	
" powder house	14.00	
Cementing springs	75.00	
Total	$3,605.30	$.018

Discussion of Additional Labor Costs, Camp 2, 1912.

The several items, it is thought, are self-explanatory. Most of these expenditures are of the nature of fixed investment expenditures. A few are clearly maintenance expenditures that should be charged against the 1912 logging. The total of these costs, however, is small, and it is assumed that they are all investment expenditures and that they should be pro-rated over a 4-years' cut, the cut for each of the 4 years averaging as much as the 1912 cut.

The total of these expenditures amounts to $3605.30, or about 7¢ per M ft. when based on the 1912 cut, and .018¢ when based on a 4-years' cut. From the present camp the Company will operate for at least 4 years more.

It is realized that these expenditures could be put in better form, but the amounts are so small that it is thought that any elaborate discussion would not be justified.

Partial Statement of the Supply Cost, Depreciation Allowance, etc., at Camp 2, 1912, Based on 50,300 M Feet.

Item	Total Cost	Cost per M ft.
Wire rope	$ 5473.33	$.108
Pipe fittings and valves	295.26	.006
Engineering supplies	25.99	.001
Shop and woods tools	712.66	.014
Rigging	2256.87	.045
Oil. waste and grease	2774.32	.055
Nails	256.08	.005
Rolling stock, trucks	2873.87	.057
R.R. Motive Power	4365.11	.087
Shop supplies	1078.09	.021
Fuel oil	6433.00	.128
Sand	134.00	.003
Office supplies	121.25	.002
Track equipment	7445.54	.148
Freight	2808.37	.056
Charity	90.61	.002
General expenses	135.70	.003
Total	$37280.05	$.741

Discussion of the Supply Cost, Depreciation Allowance, etc., Statement, Camp 2, 1912.

Wire Rope: Cost of main line, trip line, and main loading lines used during the year. The data secured are as follows:

Inventory value, Jan. 1, 1912	-	$2646.65
Purchased in 1912	-	3994.78
		6641.43
Inventory value Jan. 1, 1913	-	1168.10
	Loss -	$5473.33

The following is the size of the lines:

Main line -	$1\frac{1}{4}$"
Trip line -	5/8"
Loading line -	1-1/8"

Pipe Fittings and Valves: The data secured are as follows:

Inventory Jan. 1, 1912 -	$1008.57
Purchased in 1912 -	1814.69
Total -	$2823.26
Inventory Jan. 1, 1913 -	2528.00
Loss -	$ 295.26

Engineering Supplies: Cost of supplies for engineering department, such as drafting paper, tacks, etc. The data secured are as follows:

Purchased, 1912 -	$36.34
Inventory value, Jan. 1, 1913-	10.35
	$25.99

Shop and Woods Tools: The data secured are as follows:

Inventory value, Jan. 1, 1912 -	$2093.41
Purchased, 1912 -	946.99
Total -	$3040.40
Inventory value, Jan. 1, 1913 -	2327.74
Loss -	$ 712.66

Rigging: Loss or depreciation on all rigging, such as chokers, tag lines, yarding lines and crotch lines for loading rigs. The data secured are as follows:

Inventory, Jan. 1, 1912 -	$ 325.50
Purchased, " " " -	2839.27
Total -	$3164.77
Inventory value, Jan. 1, 1913 -	907.90
Loss -	$2256.87

Oil, Waste and Grease: The data secured are as follows:

Inventory, Jan. 1, 1912	-	$ 352.94
Purchased, 1912	-	3065.48
	Total -	$3418.42
Inventory, Jan. 1, 1913	-	644.10
	Loss -	$2774.32

This material was used for about ten months on the following equipment:

3 locomotives
3 yarders
3 loaders
1 unloader
1 chunking-out donkey, blocks, etc.

Rolling Stock: This is both a depreciation allowance and supply (repair parts) charge. The data secured are as follows:

Inventory, Jan. 1, 1912	-	$12599.95
Purchased, 1912	-	3295.35
	Total -	$15895.30
Inventory, Jan. 1, 1913	-	13021.57
	Loss -	$ 2873.73

This equipment consisted of 33 sets of trucks. It was not possible to secure the cost of repair parts and materials.

R. R. Motive Power: This is the depreciation allowance and cost of extras, repair parts, etc. The data secured are as follows:

Inventory value, Jan. 1, 1912	-	$13,056.20
Purchased, 1912	-	5,450.33
	Total -	$18,506.53
Inventory, Jan. 1, 1913	-	14,141.42
	Loss -	$ 4,365.11

The equipment was as follows:

1 45-T Shay locomotive
1 45-T Climzx "
1 35-T Baldwin "
1 24-T " "

The Shay (second-hand) was purchased during the year. It was not possible to secure the cost of the repair parts in total or by locomotives.

Shop Supplies: Cost of supplies bought for the shop, such as coal, iron, steel, etc. It does not include repair parts purchased for locomotives, donkeys, trucks, etc.

The data secured are as follows:

Inventory, Jan. 1, 1912 -	$ 563.28
Purchased, 1912 -	2103.80
Total -	$2667.08
Inventory, Jan. 1, 1913 -	1588.99
Loss -	$1078.09

Fuel Oil: Cost of fuel oil used on three locomotives for about ten months, and two yarders for about six months. It is impossible to give the working days of the locomotives other than to say that not more than three locomotives worked during one day and that the locomotives burned oil during the entire logging season. Yarders 1 and 2 started to burn oil on about July 10 and continued to do so during the remainder of the year. (See record of yarding).

The cost data secured are as follows:

Purchased, 1912 -	$7259.08
Inventory, Jan. 1, 1913 -	825.20
	$6433.88

Track Equipment: Depreciation and supply charges

on steel, track bolts, spikes, rail braces, nuts, tie plates, angle bars, rail braces, etc. The cost data secured are as follows:

Inventory, Jan. 1, 1912	-	$36,838.88
Purchased, 1912	-	917.41
Total	-	$37,756.29
Inventory, Jan. 1, 1913	-	30,310.75
Loss	-	$ 7,445.54

It will be noted that the depreciation or supply costs as enumerated are based on the inventory values. The writer cannot indicate the method used in fixing the depreciation. Some charges seem too low, others too high. It will also be noted that there are a number of items of expense not given in this statement, such as: depreciation on donkey engines, ties, blocks and hooks, shop, boom improvements, electric light plant, bunk house equipment, cook house equipment, logging camp buildings and dwellings; the supply cost of powder, water works supplies and booming and rafting supplies

Labor Cost Output Yarder No. 3, Camp 2, Oregon, 1912,

Based on 11,849 M ft.

Item	Total Cost	Cost per M ft.
Yarding	$9,871.00	$.833
Loading	2,241.30	.189
Moving Donkeys	122.20	.010
Rollway Construction	1,303.10	.110
Digging Donkey Settings	102.65	.009
Blasting Stumps in Woods	399.45	.034
Clearing right-of-way	939.55	.079
R.R. Construction, other than clearing right-of-way	2,584.00	.218
R.R. Maintenance	496.55	.042
R.R. Operation	1,900.00	.160
	$19,958.80	$1.684

Discussion of Labor Cost, Output Yarder No. 3, Camp 2, Oregon, 1912.

Yarding: The logs handled by Yarder No. 3, as has been stated, did not belong to the Company, but were logged by contract, the Company doing all the work except the felling and bucking. The statement includes the total labor cost other than the pro-rated cost for the maintenance of equipment, main line railroad, booming and rafting ground and dump. The discussion of the total labor costs will explain the meaning of the several items. It is interesting to note that the cost for yarding all the timber was 69¢ per M ft., while the cost of yarding this timber was 83¢ per M ft. It has been brought out that the conditions were practically the same other than that Yarder No. 3 handled shorter logs. The effect would be more striking if we had the cost of yarding with Yarders Nos. 1 and 2 instead of the total cost of yarding.

Rollway Construction: Nine rollways were built at an average cost of about $133. This includes the entire cost as discussed under the total cost of logging, with the exception of digging donkey settings.

Clearing Right-of-way: The cost of clearing the following right-of-way was charged to this logging:

Spurs	-	5,400 ft.
Sidings	-	2,100 "
Total	-	7,500 "

This is at the rate of about $600 per mile when based on 7500 ft., and about $900 per mile when based on 5400 ft. (See discussion of clearing right-of-way under total labor cost.)

R. R. Construction: The cost of railroad construction other than clearing right-of-way, amounted to $2584. This is at a rate of about $1825 per mile, based on 7500 ft.

Scale of Wages, Camp 2, Oregon, January 1913.

Head bucker,	$4.25	per	day
" faller,	3.75	"	"
Second "	3.50	"	"
Buckers,	3.25	"	"
Limbers,	3.00	"	"
Snipers,	3.00	"	"
Hook tender,	6.00	"	"
Rigging man,	4.00	"	"
" "	3.50	"	"
" "	3.25	"	"
Whistle punk,	2.50	"	"
Chaser,	3.50	"	"
Tommy tender,	3.25	"	"
Yarding engineer,	4.00	"	"
Yarding fireman,	2.75	"	"
Woodbuck,	2.50	"	"
Wood chopper,	2.50	"	"
Log brander,	2.50	"	"
Head loader,	5.00	"	"
Second "	3.75	"	"
Loading engineer	3.50	"	"
Foreman-woodbuck, loader,	2.50	"	"
Locomotive engineer,	5.00	"	"
" "	5.00	"	"
" "	3.25	"	"
" Fireman,	3.25	"	"
" "	3.25	"	"
" "	2.75	"	"
Conductor,	4.50	"	"
Brakeman,	3.75	"	"
Section Boss,	3.50	"	"

Scale of Wages, Camp 2, Ore., Jan. 1913 (Cont'd)

Section hands,	$2.50	per day
Engineer, unloader,	3.00	" "
Rafting master,	3.50	& board per day
" hands,	3.25	per day
Blacksmith,	5.00	" "
" helper,	3.25	" "
Mechanic,	5.00	" "
Car tinkerer,	3.25	" "
Pump man,	3.00	" "
Cook,	250.00	per month, pays for help.
Filer,	5.50	per day
Bull cooks,	35.00	per mo. & board
Electric light man,	100.00	per mo.
Scaler,	100.00	" "
Foreman,	200.00	" "

Cost of Logging, Camp 3.

The following report deals with the cost of logging at a camp in Washington, here referred to as Camp 3. The data was taken from the books and records of the Company. It has not been possible to discuss all the costs in the most satisfactory manner.

Location: The camp is located in the State of Washington, 6½ miles by the logging railroad from a rather large river.

Topography and Surface: A topographic map, showing the country logged during 1912, accompanies this report. This map also shows the location of railroads, rollways, boundaries of yarding units, and the location of swing donkeys. The grades on the railroads shown did not exceed 3%. However, the location and mileage of the railroads do not indicate the "show" as it relates to the "ground". The map shows that the country

to the east, north and west had previously been logged. This logging was done by another company. There is no question but what the country would have been opened up differently by the present owners if no logging had been done. A considerable amount of timber was logged during the year simply to save the value of the stumpage, and in Sec. 4, 300 M ft. of timber was left standing because it was clear that the cost of logging would amount to more than the logs would bring. Of course, the stand per acre, which is treated under another heading, would also affect the location and mileage of the railroads. The "show", it is thought, from the standpoint of country represented about an average one, as the country is not particularly rough or badly broken up. The "show", however, from the standpoint of brush, rotten stumps, and down timber, was a bad one. The area logged, and to be logged, is, in a general way, a plateau considerably higher than the river. The main railroad enters the tract as shown on the map from the west. From the west boundary this main line has an average favorable grade of about 3%. There are no adverse grades. In several places the maximum favorable grade is about 6%.

Character of Forest: The stand was practically hemlock, running not more than 5% to Douglas fir. It cut out about 45 M ft. per acre, the trees averaging about 32" D.B.H. On the average, three 32' logs were cut from the trees.

Output: The river scale for the year 1912 amounted to 19,586,000 ft. B.M. The logs were not scaled at the camp,

but a record of the output by logs per yarder per yarding days was kept, which is as follows:

Month	No. of Yarding Days: Yarder #1	Yarder #2	Output Logs: Yarder #1	Yarder #2	Total No. of logs	Av. No. logs per day: Yarder #1	Yarder #2
April	15½	12	1128	1284	2412	83.5	107
May	23½	25	1756	2989	4735	73.8	119.5
June	21	21	1934	2055	5989	92	97.8
July	20½	16	1556	1162	2918	80.7	72.6
Aug.	23½	19	1832	902	2734	77.9	47.4
Sept.	24½	18½	2171	1089	3260	88.6	58.8
Oct.	22	26	1694	2494	4088	72.4	95.9
Nov.	14½	17½	1219	1734	2953	84	99 —
Dec.	10	15	847	1330	2177	84.7	88.6
Total	173	170	14117	15039	29156	81.6	88.4

Total number of machine days- - - - - - 343
Av. output in logs per machine per yarding day- - - - - - - - - - 85
Av. output in M ft. B.M. per machine per yarding day- - - - - - 57
Av. volume M ft. B.M. per log - - - - - 670
Av. stand M ft. B.M. per acre, about - 45
Av. diameter of tree, inches D.B.H. - 32
Av. number 32' logs per tree- - - - - - 3

The yarding time included in the above statement includes break-downs and donkey moves that did not take more than five hours, so there was really less than 343 machine days during the year.

Labor Cost, Camp 3, Washington, Calendar Year 1912.

19,586,000 ft. B.M. logged during the year.

Items	Total Cost	Cost per M ft.
Felling	$6,358.05	$ .324
Bucking	7,840.45	.400
Yarding	23,246.45	1.189
Loading	4,853.80	.247
Railroad operation	6,874.80	.351
" maintenance	7,305.65	.373
Shop	3,618.20	.180
Rollways	1,667.40	.085
Rafting	1,940.40	.099
Moving donkeys	916.65	.046
Surveying	588.85	.030
Topographical survey	643.70	.032
Watching Camp	99.00	.005
Fighting fire	197.60	.010
Spur #2	607.25	.031
Total labor cost	$66,756.25	$3.402

Felling: Labor cost, including one-half the wages of the filer. The following are the wages paid:

Head faller - - - $3.60 to $3.75 per day
" " - - - 3.40 to 3.50 " "
Filer - - - - - - 4.00 per day

Bucking: Labor cost of cutting trees into log lengths, including the wages of the head bucker and one-half the wages of the filer. The head bucker has charge of the felling and bucking crews, passes on the timber to be felled and bucked, and indicates the point where the cuts are to be made. The following are the wages paid:

Head bucker - - - $4.00 per day
Buckers - - - - - 3.00 to $3.25 per day

Yarding: Labor cost of transporting the logs from the stump to the landing. It includes the cost of moving

donkey engines (yarders) up to June 1. For the maximum yarding distance, per cent of timber double-hauled, character of ground, etc., see the accompanying map. The roaders and yarders burned wood. The yarding crew was about as follows:

1 Hook tender - - -	$6.00	to	$6.50	per	day
2 Rigging men - - -	3.25	to	$4.00	"	"
2 Choker setters- -	3.00	to	3.25	"	"
1 Whistle punk- - -	2.50			"	"
1 Sniper- - - - - -	3.00	to	3.25	"	"
1 Limber- - - - - -	3.00			"	"
Chaser- - - - - -	3.25	to	3.75	"	"
Tommy tender- - -	3.25	to	3.50	"	"
Yarding engineer-	4.00			"	"
Fireman - - - - -	2.75	to	3.00	"	"
Woodbuck- - - - -	2.75	to	3.00	"	"
Brancing man- - -	2.50	to	3.00	"	"

When double-hauling was in progress the following additional men were used: engineer, fireman, woodbuck, hooker, and, when the "show" was hard, another chaser.

Loading: Labor cost, logs from landing to trucks, including the cost of moving the loaders. 8½"x10" double-drum Willamette loading engines were used. The following is the loading crew:

Head loader - - - -	$4.00	per	day
Second " - - - -	3.50	"	"
Loading engineer- -	3.25	"	"
Fireman - - - - - -	2.75	"	"

Railroad Operation: Three locomotives were operated during the year - a 50, 37 and 32-T Shay. The two larger Shays hauled logs, the 50-T Shay working on the main line between the camp and the river, a distance of 6½ miles; and the 37-T Shay worked between the camp and the landings, an average distance of about three-fourths of a mile. The 32-T Shay was

used in building railroad. With the exception of about 700 ft. of spur, none of the railroad constructed was used in 1912. The 50-T Shay hauled 7, 8 or 9 loads from the camp to the river, making four or five trips per day. The locomotives burned oil. Unloading was accomplished by means of a gin pole, crotch line and donkey engine, and a train of eight cars was unloaded in ten or twelve minutes.

A train crew was made up as follows:

Locomotive engineer - - -	$4.25	per day
" fireman- - - -	3.25	" "
Conductor - - - - - - - - -	5.00	" "
Brakeman- - - - - - - - - -	4.25	" "

Railroad Maintenance: Labor cost of keeping about eight miles of railroad in good condition as to surface and alignment, keeping ditches open and taking care of slides. It takes care of additional gravel, hauling, ballasting and the labor and train crew used in securing and transporting the gravel. The road at the beginning of the year was in very poor condition as to surface, alignment and ballast.

Shop: Labor cost of the up-keep of 3 locomotives, 14 donkey engines (roaders, yarders, loaders, chunking-out donkeys and unloading donkey), 24 sets of trucks, rigging, tools, blocks, hooks, etc. From two to four men per day were employed in the shop throughout the year.

Rollways: Labor cost of building eight rollways which cost includes the labor of clearing site, building, digging donkey settings, and slinging loading rigging on gin

poles. Average cost per railway, $208.

Rafting: Labor cost of putting logs in shape for towing to the mill.

Moving Donkeys: Labor cost of moving donkeys after June 1.

Surveying: Labor. Possibly 50% of this cost is properly chargeable against the 1912 logging.

Topographic Survey: Labor. Possibly 15% of this cost is properly chargeable against the 1912 logging.

Spur #2: Complete cost of building a railroad spur 800 ft. long, which is at the rate of $3950 per mile.

The above statement does not include the wages of foreman and timekeeper or any other overhead expense.

Statement of Supplies, Extras, etc., Camp 3, Washington, 1912.

Cost per M ft. based on 19,586,000 ft. River scale.

I t e m	Total Cost	Cost per M ft.
Oil, grease, waste and packing	$ 955.00	$.049
Freight	1572.00	.080
Shop supplies	1353.00	.069
Tools	476.00	.024
Railroad motive power	965.00	.049
Rolling stock	358.00	.018
Donkey engine supplies	1354.00	.069
Buildings	820.00	.042
Scaling (not on payroll)	254.00	.013
Powder	3661.00	.187
Wire rope	2777.00	.142
Engineering supplies	99.00	.005
Locomotive sand	151.50	.008
Rigging	851.08	.044
Pipe, pipe fittings and valves	190.68	.010
Fuel oil	1844.00	.094
Office supplies	143.00	.007
General expenses	46.00	.002
Total	$17870.26	$.912

Discussion of Supply, Etc., Statement

Camp 3, Washington, 1912.

The statement represents the purchases made during the year. In a general way the stock on hand at the beginning of the year was below normal and about normal at the close. The camp can reach Portland by telephone, and supplies can reach the camp from this city in a few hours, making it unnecessary for the camp to carry a large stock on hand.

Oil, Grease, Waste, Packing, etc.: It is impossible to state the amount of equipment using these supplies. The equipment on hand, and used during some part of the year, is as follows:

3 locomotives (geared)
11 yarding, roading, chunking-out and power scraper donkeys
3 loading donkeys
24 sets of trucks, blocks, etc.

A study of the yarding record map, with the knowledge that about three miles of railroad was constructed during the year, will give some idea of the equipment days.

Freight: Cost of freight on woods supplies and extras; commissary and cook house supplies, and track equipment, amounting to $3,714, used on the new railroad.

Shop Supplies: Cost of supplies, such as coal, iron, steel, lumber, etc., used in the repair of equipment.

Tools: Cost of all tools purchased during the year, such as shop, carpenter and woods tools.

Railroad Motive Power: Cost of all extras purchased

during the year for the repair of three locomotives.

Rolling Stock: Cost of all extras purchased during the year for the repair of 24 sets of logging trucks.

Donkey Engines: Cost of all extras purchased during the year for the repair of 14 donkey engines, three of which were loaders. For an idea of the machine days, study the yarding record and map.

Buildings: Lumber, etc., purchased for the maintenance of old camp buildings and the building of new ones.

Powder: Cost of powder purchased during the year. About 25% of this was used in the woods in connection with the yarding.

Rigging: Cost of all rigging, such as chokers, tag lines, yarding lines and crotch lines for loading rigs, purchased during the year.

Fuel Oil: Cost of fuel oil purchased during the year. The oil was used on three locomotives. It is impossible to state the locomotive working days. Two of the locomotives hauled logs. The other was used in constructing railroad. The oil cost 95¢ per barrel, or 42 gallons.

The total cost of logging as shown by the two statements, is as follows:

Labor - - - - - - - - - - - - -	$3.41 per M ft.
Supplies, extras, etc.- - - -	.912
Total - - -	$4.322

It will be noted that this total does not include any cost for administration, depreciation on the equipments,

etc., or any pro-rated cost for railroad construction other than the cost of building 800 ft. of spur line.

Cook House Statement, Camp 2, Washington, 1912.

Inventory Supplies, 1912,	$391.75	
Supplies and Equipment purchased,	15,449.97	
Labor,	3,038.70	
Receipts from meals,		$15,827.75
Inventory Supplies, 1913,		438.53
" Equipment, 1913,		613.12
Net Loss,		2,001.02
	$18,880.42	$18,880.42

No inventory was taken of the cook house equipment at the close of 1911. During the year a fire destroyed the cook house and its contents, the damage being estimated at $1,000 - one-half for supplies, the balance for equipment - so the fire will account for about $500 of the loss.

Sixty-three thousand three hundred eleven (63,311) meals were served during the year at $.25 per meal.

It is estimated by the person in charge of this department that the cook house showed a loss of $900 by June 1. The superintendent feels that the loss for the year was due to poor management.

One-half of the clerk's salary was charged against the cook house department.

Statement of Commissary Department

Camp 3, Calendar Year 1912.

To 1912 inventory,	$ 150.00	
Supplies purchased,	6060.00	
Labor (½ clerk's salary)	338.00	
By sales,		$6532.20
1913 inventory,		1294.55
Net Profit,	1278.75	
	$7826.75	$7826.75

It will be noted that the business for the year amounted to $6532.20, which includes practically only about seven months as the total sales from January 1 to June 1 amounted to only $629.05.

During the year the stock was increased as is indicated by the inventories at the close of 1912 and 1913. The stock at the close of the year was not large enough, but it was as large as the store building would permit. A new building is being constructed and a stock two or three times as large as the present stock will be carried.

The Company is operating within 6½ miles of competition at the point where their logs are rafted.

Scale of Wages, Camp 3, Washington, January, 1913.

Head bucker - - - - - -	$4.20		per	day
" faller - - - - - -	3.60	to $3.75	per	day
Second " - - - - - -	3.40	to 3.50	"	"
Limbers - - - - - - - -	3.00		"	"
Snipers - - - - - - - -	3.00	to 3.25	"	"
Hook tender - - - - - -	6.00	to 6.50	"	"
Rigging man - - - - - -	3.00	to 4.00	"	"
Whistle punk- - - - - -	2.50		"	"
Chaser- - - - - - - - -	3.25	to 3.75	"	"

Tommy tender- - - - -	$3.25	to	$3.50	per day
Yarding engineer- - -	4.00			" "
Woodbuck- - - - - - -	2.75	to	3.00	" "
Branding man- - - - -	3.00			" "
Head loader - - - - -	4.00			" "
Second " - - - - -	3.50			" "
Loading engineer- - -	3.25			" "
Locomotive " - - -	4.25			" "
" fireman- -	3.25			" "
Conductor - - - - - -	5.00			" "
Brakeman- - - - - - -	4.25			" "
Section boss- - - - -	3.50			" "
Section hands - - - -	2.50			" "

Cost of Logging, Camp 4.

The following deals with the logging cost at a camp in the western foothills of the Cascades in Washington. The yarding records for three years is thought to be satisfactory cost data. Unfortunately it was not possible to secure a topographic map of the country logged, and so the data is not as available as it otherwise would be. However, having this record makes the other data more understandable. The information does not always show just what the writer would like to have it show, and the discussions of the several segregations cannot be said to be complete by any means.

In connection with the charges for the maintenance of equipment, it should be borne in mind that the company's machine and blacksmith shop is ever so much more complete than is ordinarily found in logging camps.

Statement of Logging Cost, Camp 4, 1912.

Labor (Cost based on 48,678,550 ft. log scale)

	Inv. Jan. 1: 1912	Total	Inv. Jan. 1: 1913	Total Loss
Felling & Bucking	$2025	$39603	$4717	$34891
R.R. Section Crew	1411	15212	850	14362
R.R. Operation		7572		7572
Donkey Repairs		351		351
Towing & Scaling		5538		5538
General Expenses		2173		2173
Boomage		29207		29207
Log Freight		73017		73017
Main line	1507	5430	1000	4430
" " #2	1260	1260	1260	0
Spurs	11840	41045	13107	27938
Landings	946	7280	600	6680
Blacksmith & Repairing		2130		2130
Bookkeeper		1168		1168
Yarding & Loading		67109		67109
Engineering & Supervision		6715		6715
Accidents		73		73
Liability Insurance		2461		2461
General Repairs		168		168
Ties	5702	8808	8808	0
Machine Shop Operation		4561		4561
Stables	83	156	156	156
Donkey Repairs	436	3453	485	2968
Freight & Cartage		847		847
General Supplies	491	3829	555	3274
Oil & Waste	128	1660	184	1476
Blacksmith Supplies	845	2893-	650	2243
Wire Rope	2385	12287	2654	9633
Locomotive Repairs	1229	1633	1298	335
Office Expenses		225		225
Fuel, Oil & Coal	3365	30765	1754	29011
General Expenses		873		873
Landings		370		370
Tools	1035	2442	1302	1140
Engineering Supplies	50	60	50	10
Locomotive Supplies		351		351
Donkey "	277	716	322	394
General Repairs		82		82
Machine Shop Supplies		1806		1806

The above statement includes the cost of maintaining the Main Line - a 60-T Shay - locomotive and 60 sets of

logging trucks. This cost is not properly chargeable against the logging as the logging company is paying a specified sum per M ft. for transporting the logs by rail from the camp to the water. The work, however, was done in the shop of the logging company, and the credited amount is shown on one of the following statements. The statement showing the cost per M ft. is the true statement. The other credited amounts have been handled in the same way.

Distribution of Accounts Credited, 1912.

Switching	$ 61
Machine Shop	3796
Oil and waste	410
Fuel	6988
Tools	116
Wire	30
Donkey Supplies	39
General "	47

Distribution of Supplies Subject to Inventory 1912.

	Inventory 1-1-12	Total	Inventory 1-1-13	Loss Total	Loss per M
Logging Equipment	$14174	$27213	$26165	$1048	$.022
Houses & Improvements	7000	7000	7000	0	0
Rails & Fastenings	64266	86778	86241	537	.011
Rolling Stock	36000	38370	38250	120	.002
Right-of-way	251	251	251	0	0
Hourse & Wagons	750	750	750	0	0
Office Fixtures	100	100	100	0	0
Boomsticks & Chains	2194	2654	2654	0	0
Furniture & Fixtures	60	86	75	11	0
Coal Bunkers	4000	4000	4000	0	0
Machine Shop	9800	9800	9800	0	0
Cook House Equipment	1200	1532	1200	332	.007
Total				$2048	.042

Statement of Logging Costs Less Credits,

Camp 4, 1912. Cost Based on 48,678,550 ft. Log Scale.

Item		Total Cost	Cost per M
Felling and Bucking		$34891	$.717
Labor	$34891		
Yarding & Loading		67109	1.379
Labor	67109		
Landings		7050	.145
Labor	6680		
Supplies	370		
R.R. Operation		7511	.154
Labor	7511		
Towage & Scaling		5538	.114
Log Freight		73017	1.500
R.R. Spurs (Contract) Grades		27938	.574
Main Line (Contract) Grade		4430	.091
Boomage (Contract)		29207	.600
Bookkeeper		1168	.024
Engineering & Supervision		6715	.138
General Expenses		3046	.063
Labor	2173		
Supplies	873		
R.R. Ties		0	
Freight & Cartage		847	.017
Oil & Waste		1066	.022
Tools		1024	.021
Engineering Supplies		10	.0
Wire Rope		9603	.197
Stable		156	.003
Supplies	156		
Office		225	.005
Supplies	225		
Fuel, Oil & Coal		22023	.452
Liability Insurance		2461	.050
R,R. Section Crew		14362	.295
Labor	14362		
General Repairing		3442	.071
Labor	168		
Supplies	3274		
Machine Shop Operation		2571°	.053
Labor	4561		
Supplies	1806		
Blacksmithing & Repairing		4373	.090
Labor	2130		
Supplies	2243		

Item		Total Cost	Cost per M
Locomotive Repairs		$ 335	$ .007
Supplies	$ 335		
Locomotive Supplies		351	.007
Supplies	351		
Donkey Repairs		319	.068
Labor	351		
Supplies	2968		
Accidents		73	.001
Ties		0	
Donkey Supplies		394	.008
General Repairs (Supplies)		82	.002
Depreciation		2048-	.042
Total		$336385	$6.910

° $3796 has been credited because of work done for the main line railroad. It possibly would be better to have credited it to the machine and blacksmith shop, but there is no way of dividing the credited amount.

Discussion of Items of Cost, Camp 4, 1912.

Felling and Bucking: Labor, includes the cost of felling and bucking, also the cost of filing. As a rule, two buckers work with a set of fallers. Two filers are employed. Forest consisted of old and second-growth timber. Ground hilly and practically level. Cut out possibly 50 M ft. per acre, as follows:

Cedar,	45%
Hemlock,	5%
Douglas fir,	50%

The wages paid were as follows:

Head faller,	$3.75	per day
Second "	3.50	" "
Buckers,	3.25	" "
Filers	3.75	" "

Yarding and Loading: All timber was yarded direct to landing. Five 12x12" Washington Iron Works compound yarders, employed during most of the year. Yarders burned oil. Ground hilly and practically level; where hilly, the logs were yarded down-hill. Logs cut from 24 to 40 ft. in length. The logs averaged 1000 ft. in volume. The average output per yarder per yarding day was 37,500 ft., the output for the year amounting to 48,678,550 ft. Forty-five per cent of the timber was cedar; the balance Douglas fir and hemlock. The yarding and loading crew was made up as follows:

Hook tender	$5.00	per day
Rigging slinger	3.50	" "
2 Chokermen	3.25	" "
Whistle punk	2.75	" "
Sniper	3.00	" "
Swamper	3.00	" "
Chaser	3.25	" "
Tommy tender	3.25	" "
Engineer	3.75	" "
Fireman	2.50	" "
Spool tender	3.00	" "
Head loader	4.50	" "
Second "	3.50	" "

Fireman received ¼-day's time for firing up.

The logs were loaded by means of a gin pole, the power being furnished by a spool on the yarding donkey.

The average maximum yarding distance was about 800 feet.

The following is the yarding record for the year:

Average Output per Donkey per Month, Camp 4, 1912.

	Donkey Days	Output Feet	Average per Donkey Day - ft.
February	120	4,324,653	36,039
March	120.5	4,592,650	38,113
April	129	5,300,000	41,085
May	122	4,938,487	40,480
June	127.5	4,382,220	34,370
July	97	3,779,310	38,962
August	130	5,001,530	38,473
September	121.5	4,631,420	38,118
October	125	4,325,800	34,205
November	123	4,305,750	35,006
December	84	3,096,730	36,866
Total	1299.5	48,678,550	37,460

Cedar - 45%
Hemlock - 5%
Douglas Fir -50%

Landings. The landings cost about $100 apiece for the year. A gasoline donkey is used in their construction. The $370 given under "Supplies" was expended for gasoline.

R. R. Operation: Labor cost of operating 3 Shay locomotives - 45, 37 and 17-T. The 45 and 37-T were used in hauling logs on the spurs, the 17-T being used in hauling men, track construction, etc. Five sides were operated during most of the year, and the miles of track over which the locomotives operated amounted to about 10 miles. The maximum average haul amounted to about 5 miles. It should be noted that the locomotives hauled water in tank cars to the yarders. It was not possible to secure a map of the camp, and the working mileage of the logging engines cannot be approximated. The crew with

the logging trains consisted of an engineer, fireman and brakeman. The crew on the 17-T locomotive consisted of an engineer and fireman.

The wages of the train crew were as follows:

Engineer - - - - -	$4.00 per day
Fireman- - - - - -	3.25 " "
Head Switchman - -	4.00 " "
Second " - -	3.50 to $3.75 per day

Two brakemen were used on the main line. Locomotives burned oil. Trucks were used for the most part.

Log Freight. Logs hauled a distance of 20 miles to the Sound over the Mainline R. R. Co. for $1.50 per M ft. This includes the dumping. One locomotive, a 60-T Shay, hauls the logs over this road, making two trips per day. The camp output runs between 200 and 250 M ft. per day. About two hours per day are lost to the locomotive in unloading. At one place for a short distance it is necessary to double up. Daily mileage of locomotive is about 80 miles. Standard trucks, which are kept up by the Mainline R. R. Co.,are used.

Spurs and Mainline R. R. Labor cost of grading these roads pro-rated against this year's logging as indicated by inventories. It is not possible to give total mileage charged against this year's logging. The cost of clearing right-of-way and grading amounted to from $40 to $50 per station. This work was done by contract and includes the cost of clearing right-of-way.

R. R. Section Crew: Labor cost of laying and tearing up track, surfacing, ballasting, and maintenance of track, pro-rated against this year's logging as indicated by inventories. The cost of labor for laying and tearing up track amounted to about $500 per mile. The cost of surfacing and ballasting with gravel amounted to from $500 to $800 per mile. The maintenance of the tracks because of satisfactory ballasting was negligible.

Bookkeeper: Salary of bookkeeper who does practically all the paper work connected with the logging. In addition to the amount given in the statement, he received board and lodging. All of the bookkeeper's salary is charged against the logging, no part being charged against the store or cook house.

Locomotive Repairs: Repair parts purchased and used right away. It differs in no way from locomotive supplies other than locomotive supplies are supposed to cover repair parts kept in stock. It should be noted in this connection that the Company has a well equipped machine and blacksmith shop, and does most of the work ordinarily done in the larger towns or cities. The equipment in the machine shop cost $8000 when new. These supplies were used in 3 locomotives, a 45, 27 and 17-T Shay.

Donkey Repairs.

Labor - Labor in addition to that regularly employed

in the blacksmith and machine shop.

Repair Supplies - Repair parts purchased and used right away. It differs in no way from donkey supplies other than that the item "donkey supplies" comes from the stock regularly carried on hand. It should be noted that the donkey equipment consisted of six yarding donkeys, a pile driver donkey, and a power scraper donkey in the sane pit. For the most part five "sides" were operated and all logs were yarded direct.

Blacksmithing and Repairing.

Labor - Labor cost of doing repairs on locomotives, trucks, donkeys, blocks, rigging, etc. The following is the help:

Blacksmith - - - - -	$4.50	per day
" helper- -	3.00	" "

Supplies - Cost of material used in making blacksmith repair parts for locomotives, donkeys, rigging, etc.

Machine Shop Operation.

Labor - Labor cost of doing repairs on donkeys, trucks, locomotives, etc. The following is the help:

Machinist - - - - -	$150	per month
" helper- -	2.75	per day
Carpenter - - - - -	4.00	" "
Car tinkerer- - - -	3.25	" "
Foundry man - - - -	4.00	" "
Utility man - - - -	3.25	" "

Supplies - Cost of material used in making machine shop repair parts for locomotives, flat cars, donkeys, etc.

It should be noted the equipment consists of:

1 45-T Shay locomotive
1 37-T " "
1 17-T " "
10 flat cars
7 donkeys, and blocks, rigging, etc.

General Expenses - Cost of taxes, dues to Association, travel, etc.

Fuel Oil - Cost of fuel oil used on 3 locomotives and 5 donkeys.

The cost of the upkeep of all equipment, including 4 locomotives, 7 donkeys, 60 sets of trucks, rigging blocks, 1 oil car, 2 water cars, etc., is as follows:

Locomotive Repairs	
Supplies - - - - - - - - - -	$335.00
Donkey Repairs	
Labor- - - - - - - - - - - -	352.00
Supplies - - - - - - - - - -	2968.00
Blacksmith & Repairing	
Labor- - - - - - - - - - - -	2130.00
Supplies - - - - - - - - - -	2242.00
Machine Shop Operation	
Labor- - - - - - - - - - - -	4561.00
Supplies - - - - - - - - - -	1806.00
Locomotive Supplies - - - - - - -	351.00
Donkey Supplies - - - - - - - - -	394.00
	$15139.00

Towage and Scaling - Towage on boom sticks from _____ to _____, or booming ground, at a rate of 50¢ apiece; contract scaling ranging from 3¢ to 5¢ per M ft.; and camp scaling - scaler's wages $2.75 per day. Scaling is now done by the Bureau for about 5¢ per M ft.

Boomage - Done by the Mainline R. R. Co. for 60¢ per M ft. While the booming company is a separate corporation, it is really owned by the same people that own the logging company.

Statement of Logging Cost Camp 4, 1911 - Labor

Based on 51,721,436 ft.

Item	Inventory Jan. 1-1911	Total	Inventory Jan. 1-1912	Loss
Machine Shop Operation	$	$ 3150	$	$3150
R.R. Section Crew	1874	15300	1411	13889
Scaling		646		646
Bookkeeper		1200		1200
Engineering & Supervision		6046		6046
General Expenses		2097		2097
R.R. Operation		5170		5170
Blacksmithing & Repairing		2155		2155
General Repairing		120		120
R.R. Ties	4782	5702	5702	0
Locomotive Repairs		246		246
Landings	1800	6139	946	5193
Yarding & Loading		56390		56390
Felling & Bucking	5493	35356	2025	33331
Donkey Repairs		256		256
R.R. Spurs	11681	28777	11840	16937
R.R. Main line	1853	7262	1507	5755
" " " #2	1260	1520	1260	260
Log Freight		77582		77582
Boomage		31040		31040

Supplies 1911.

Item	Inventory Jan.1-1911	Total	Inventory Jan.1-1912	Loss
Freight & Cartage	$	$ 404	$	$404
Oil & Waste	225	1284	128	1156
Tools	999	2094	1035	959
Donkey Supplies	224	371	277	94
" Repairs	374	587	436	151
Locomotive Supplies		172		172
Locomotive Repairs	969	1633	1229	404
Blacksmith Supplies	685	2295	845	1450
General Supplies	523	1708	491	1217
Engineering Supplies	50	76	50	26
Towing and Scaling		4476		4476
Wire Rope		10245	2385	7860
Stables		461	83	378
Landings		329		329
Office		125		125
General Expenses		725		725
Fuel Oil & Coal	4129	29270	3365	25905
Liability Insurance		3221		3221
Accidents		67		67
Machine Shop Supplies		795		795

Segregation of Accounts Credited Camp 4, 1911.

General Supplies	$6.00
Donkey Repairs	7.00
Oil and Waste	272.00
Oil and Coal	6279.00
General Expenses	96.00
Tools	31.00
Wire	102.00
Switching	112.00
Stables	138.00

Equipment, etc., Subject to Inventory, Camp 4, 1911.

Item	Inventory Jan.1,'11	Total	Inventory Jan.1,'12	Loss	Loss per M
Rails & Fastenings	$38632	$64425	$64265	$160	$.003
Rolling Stock	35775	36723	36000	723	.014
Logging Equipment	14397	14658	14174	484	.009
Office Fixtures	100	100	100	0	
Furniture & Fixtures	60	84	60	40	.001
Boom sticks and chains	2056	2194	2194	0	
Houses & Improvements	5989	7030	7000	30	.001
Horses & Wagons	750	750	750	0	
Coal Bunkers & Oil Tank	2127	4160	4000	160	.003
Machine Shop	883	9808	9800	8	
Right-of-way	101	252	252	0	
Stumpage		180918			
Total				$1605	$.031

Statement of Logging Costs Less Credits, Camp 4, 1911.

Cost based on 51,721,436 feet.

Item		Total Cost	Cost per M ft.
Felling and Bucking		$33331	$.644
Labor	$33331		
Yarding & Loading		56390	1.090
Labor	56390		
Landings		5522	.107
Labor	5193		
Supplies	329		
R.R. Operation		5058	.098
Labor	5058		
Towage & Scaling		4476	.087
Scaling		646	.013
Labor	646		
Log Freight		77582	1.50
R.R. Spurs		16937	.327
R.R. Main line		5755	.111
" " " #2		260	.005
Boomage		31040	.60
Bookkeeper		1200	.023
Engineering & Supervision		6046	.117
General Expenses		2726	.053
Labor	2097		
Supplies	629		

		Total Cost	Cost per M ft.
R.R. Ties		0	
Freight & Cartage		404	.008
Supplies	404		
Oil & Waste		884	.017
Tools		928	.018
Engineering Supplies		26	.001
Wire Rope		7758	.150
Stable		323	.006
Supplies	323		
Office		125	.002
Supplies	125		
Fuel Oil & Coal		19626	.379
Liability Insurance		3221	.062
Accidents		67	.001
R.R. Section Crew		13889	.269
Labor	13889		
General Repairing		3314	.064
Labor	2097		
Supplies	1217		
Machine Shop Operation		3945	.076
Labor	3150		
Supplies	795		
Blacksmithing & Repairing		3605	.07
Labor	2155		
Supplies	1450		
Locomotive Repairs		650	.013
Labor	246		
Supplies	404		
Locomotive Supplies		172	.003
Donkey Repairs		172	.008
Labor	256		
Supplies	151		
Donkey Supplies		94	.002
Depreciation		1605	.031
Total		$308012	$5.955

It is not possible to discuss the logging costs of 1011 other than to state that one locomotive and one donkey less were used. The segregation includes the same items of cost as those for 1912.

Average Output Per Donkey Per Month, Camp 4, 1911.

	Donkey Days	Output (ft.)	Average per Donkey Days (ft)
January	40.7	1,979,767	48,643
February	79	4,581,175	57,989
March	118	6,376,083	54,034
April	122.5	6,709,484	54,771
May	113.25	5,824,728	51,432
June	121	5,020,639	41,493
July	Shut Down		
August	122	4,827,109	39,567
September	127	5,097,841	40,140
October	128.5	4,788,980	37,269
November	109.5	3,817,991	34,867
December	840	2,697,639	32,115
Total	1165.45	51,721,436	44,379

Cedar - 45%
Hemlock - 5%
Douglas Fir - 50%
Average output per yarder per yarding day - 45 M ft.

Yarding Record, 1909.

Donkey Days - 402.35

Output - 18,500,512 ft.

Average Output Per Yarder Per Yarding Day - 45,981 ft.

Average Output per Donkey per Month, Camp 4, 1910.

	Donkey Days	Output (ft.)	Average per Donkey Day (ft.)
January	110	5,013,901	45,581
February	88	4,311,301	48,992
March	107.5	5,521,153	51,359
April	95.5	4,954,263	51,877
May	104	4,384,829	46,969
June	104	5,764,423	55,427
July	Shut Down		
August	65	2,919,669	44,918
September	95	4,974,705	52,365
October	91.5	4,493,288	49,107
November	90.5	4,592,513	50,746
December	46	2,302.667	50,055
Total	997	49,732,712	49,882

Cedar - 45%
Hemlock - 5%
Douglas Fir - 50%
Average length of logs, about 36 ft.
" volume " " " 1000 ft.

Comparison of Cost, 1911 and 1912.

Items	Cost per M 1911	1912
Felling and Bucking	.644	.717
Yarding and Loading	1.090	1.379
Landings	.107	.145
R.R. Operation	.098	.154
Towage and Scaling	.087	.114
Scaling	.013	
Log Freight	1.50	1.50
R.R. Spurs, grades	.327	.574
Main line, grades	.111	.091
Main line #2	.005	
Boomage	.60	.60
Bookkeeper	.023	.024
Engineering & Supervision	.117	.138
General Expenses	.053	.063
R.R. Ties		
Freight and Cartage	.008	.017
Oil and Waste	.017	.022
Tools	.018	.021
Engineering Supplies	.001	0
Wire Rope	.150	.197
Stable	.006	.003
Office	.002	.005
Fuel Oil and Coal	.379	.452
Liability Insurance	.062	.050
Accidents	.001	.001
R.R. Section Crew	.269	.295
General Repairing	.064	.071
Machine Shop Operation	.076	.053
Blacksmithing & Repairing	.070	.090
Locomotive Repairs	.613	.007
" Supplies	.003	.007
Donkey Repairs	.008	.068
Donkey Supplies	.002	.008
General Repairs Supplies		.002
Depreciation	.031	.042
Total	5.955	6.910

Cost of Logging, Camp 5, 1912.

- The following is the average cost of logging based on a period of six months and an output of 24,864,200 ft. (selling scale) at Camp 5, Washington.

It is a conservative outfit, buying no equipment until it is strictly necessary, and taking good care of such as they have. Railroad lines are well ballasted and kept in good alignment. While the men are required to do their work, they are treated kindly, resulting in possibly one-half of the crew having been with the Company for a long time. It is safe to say that there are few companies in this region logging (stump to siding at camp) so cheaply.

The "show" can be classed as a very good one. While the timber is relatively small - it is cutting out 85 to 90 M ft. to the acre - the ground is exceptionally good. It is possible to locate the spur railroads - without encountering heavy grades - so that it is seldom necessary to yard more than 800 ft., and with an average maximum yarding distance of about 650 or 700 ft. Much of the ground is practically level, (loggers' viewpoint), and where it is not, the slopes are not so heavy as to cause the logs to run. Few hummocks, pot-holes or troublesome ravines are encountered. The ground is quite free of brush and down timber.

The owners of the timber are paying $1.25 per M ft. to another Company for hauling their logs 12 miles to water

transportation, which amount includes sorting and rafting, ready to be towed to the mill.

This logging company has been operating about three years, and they have about a seven-years' cut ahead of them. Their bookkeeper stated that the cost here given represents a fair average, the cost not having varied more than 10¢ or 15¢ per M ft. either way since they have been operating.

During this period, the Company operated three sides. The motive power used in loading was furnished by spools on the donkey engines. One locomotive, working twelve hours per day, hauled the logs from the landings to the camp siding. Fifty-six sets of trucks, maintained by the logging company, were used.

Practically all the information was taken from the books or records of the Company, and all the data is thought to be correct.

Cost of Logging Camp 5, Washington

July to December, 1912.

Based on 24,864,300 ft., Boom or Selling Scale.

Felling and Bucking	$.49 per M ft.
Yarding and Loading	.965 " " "
Switching	.138 " " "
General Logging	.12 " " "
Sundry Supplies	.10 " " "
Wire Rope	.072 " " "
Grading	.312 " " "
General Expense	.08 " " "
All other expenses, including stables, taxes, insurance and depreciation - amounting to $5,949.69, less gain on mess, hog yard and commissary, amounting to $1660, or $4289.69	.18
	$2.457

This statement was taken from the records of the Company and the classification of segregation is theirs. It is interesting to note what is included under the several segregations.

Discussion of Cost Segregations.

Felling and Bucking. This includes the labor cost of felling, bucking and filing. The discussion of the yarding record given later deals with the character of the timber. Five sets of fallers worked with the three sides, getting down about 35 M ft. per set. Three buckers worked with a set of fallers, bucking the down timber in advance of the felling, and bucking the green timber as it was felled. The following wages were paid:

Head fallers - - - -	$3.25 to $3.50	per	day
Second " - - - -	3.00 to 3.25	"	"
Filer- - - - - - - -	3.75	"	"

Yarding and Loading. Labor cost of yarding, moving donkeys, changing lines, raising gin poles, loading and laying and tearing up track. See the following yarding records for a discussion of the "show". Three 10x11" Washington Iron Works yarders were used. A gin pole was used in loading, the motive power being furnished by a spool on the yarder. The following is the yarding and loading crew:

1 Hook tender - - - - - - - -	$4.50 to $5.00	per	day
1 Rigging slinger - - - - -	4.00 to 4.50	"	"
2 Choker men- - - - - - - - -	3.00 to 3.25	"	"
1 Sniper- - - - - - - - - -	3.00	"	"
1 Knotter - - - - - - - - -	2.75 to 3.00	"	"
2 Swampers- - - - - - - - -	2.75 to 3.00	"	"

1 Whistle punk- - - - - - -	$2.50	to	$2.75	per day
1 Chaser- - - - - - - - - -	3.00	to	3.25	" "
1 Donkey engineer - - - - -	3.50	to	3.75	" "
1 Donkey fireman- - - - - -	2.50	to	2.75	" "
1 Donkey woodbuck - - - - -	2.50	to	2.75	" "
1 Spool tender- - - - - - -	3.00	to	3.25	" "
1 Head loader - - - - - - -	4.00	to	4.50	" "
1 Second " - - - - - - - -	3.00	to	3.25	" "

The section crew received from $2.50 to $2.75 per day.

Switching. Labor of train crew, also the cost of some fuel wood amounting to $400.45. The train crew was as follows:

Locomotive engineer - - - -	$4.00 per day
" fireman- - - - -	3.25 " "
Brakeman- - - - - - - - - -	4.00 " "

Some fuel wood was cut by contract at a rate of $1.25 per rick (8'x4'x22"). The amount, $706.40, appears under "Sundry Supplies". The locomotive, a 52 Shay, burned about eight ricks of wood per ten hours.

This locomotive hauled the logs to the camp siding, also water on a tank car to the yarders. The yarders were located on two spurs; one on a spur about one mile from the camp, the other two about two miles from the camp. It was necessary for this locomotive to work overtime to do the work. The logs were hauled from the camp siding to the Sound, a distance of about twelve miles, by contract at a rate of $1.25 per M ft. This rate of $1.25 includes the cost of unloading, booming and rafting.

General Logging. Labor cost of the following, which covers a period of six months:

Foreman - - - - - - - - - -	$1200.00
Scaler & Timekeeper - - -	570.00
Blacksmith & Helper - - -	846.85
Truck Repairer- - - - - - -	448.20
Chopping Boards - - - - -	8.10
Total - - -	$2995.65

The camp is directly in charge of a foreman who spends all his time in camp. The manager spends little of his time in camp, and no portion of his salary is charged against the logging in this statement, unless the item, "P.B.M.Co's office, $785.35", appearing in segregation for General Expenses, includes his salary.

One man keeps the time and does the scaling.

A blacksmith and helper and car tinkerer look after the repairs of the equipment, consisting of -

1 52-T Shay locomotive
3 10"x11" W.I.Works yarders
56 sets of trucks, Seattle Car Mfg. Co., and blocks, rigging, etc.

This equipment is three years old.

Sundry Supplies - July to December, inclusive.

Sundries - - - - - - - - - - - -	$670.81
Axes and handles - - - - - - - -	150.33
Bar, iron and steel- - - - - - -	326.97
Coal - - - - - - - - - - - - - -	100.93
Files- - - - - - - - - - - - - -	62.74
Glass gauges and gaskets - - -	8.48
Oil and Grease - - - - - - - - -	402.68
Packing- - - - - - - - - - - - -	1.44
Saws and handles - - - - - - - -	272.88
Sledges and wedges - - - - - - -	60.46
Waste- - - - - - - - - - - - - -	17.00

Locomotive Wood- - - - - - - - -	$706.40
" Repairs - - - - - - -	116.20
Truck Repairs (Credit $65.23)-	------
Donkey Repairs - - - - - - - - -	213.50
Peavies and Mattocks - - - - - -	51.25
	$3215.57
Less Credit - - -	65.23
	3150.34
Inventory Increase - -	894.00
	$2256.34
Express and Freight- - - -	243.65
	$2499.99

Wire Rope. Cost of wire rope used in yarding and main loading line, 1-1/8", trip line ½".

Grading. Pro-rated cost of clearing right-of-way and grading railroad track; also the pro-rated cost of landings. This work is done with day labor. It was not possible to determine what the grading cost per station was. The labor cost of landings ran between $50 and $70 per landing.

General Expense. Cost of following for six months:

Sundries - - - - - - - - - - - - -	$156.15
Stationery - - - - - - - - - - - -	37.35
Stamps - - - - - - - - - - - - - -	3.40
Telephone Service- - - - - - - -	128.45
P.B.M.Co's office- - - - - - - -	785.35
Demurrage- - - - - - - - - - - -	6.00
Surveying- - - - - - - - - - - -	145.00
Watchman - - - - - - - - - - - -	19.25
Fire Fighting- - - - - - - - - -	25.70
Bookkeeper - - - - - - - - - - -	721.50
Total- - - - - - -	$2058.25

All Other Expenses. Cost of following:

Stable	$490.32
Taxes	240.00
Liability Insurance	1663.75
Depreciation	3555.62
Total	$5949.69
Less gain on mess house, hog yard and commissary	1660.00
Total	$4289.69

Net gain on mess house, hog yard and commissary, during six months:

Mess house	$1112.98
Hog yard	14.80
Commissary	532.22
	$1660.00

Men were charged $5.50 per week for board. The gain on the mess house and store does not take into account depreciation on buildings, fixing lines and equipment. These are included in the depreciation on the plant.

Yarding Record, July to December, Inclusive, 1912.

Months	Yarding per day per Machine.		
	Yarder #1.	Yarder #2.	Yarder #3
July	21	0	21
August	25	11	24 3/4
Sept.	24	25	25
Oct.	25 3/4	25 1/4	26 1/4
Nov.	26	26	26
Dec.	17	17	17
	138 3/4	104 3/4	140

Total number of machine yarding days, 383.

This includes the time consumed in moving machines, one setting to another, and turning, raising gin poles and changing lines, as well as the time consumed in yarding logs from the stump to landing.

°Yarder #2 did not work during the month of July.

Total output during this time, 22,428,120 ft., camp log scale.

Average output per yarder per yarding day, 58,500 ft., camp log scale.

Average volume per log, 550 ft., camp log scale.

Average amount per truck load, 7,000 ft., camp log scale.

Size and make of machines, 10½x10¼" Washington Iron Works yarders.

"Show". Timber, second-growth, dense, fair height, averaging possibly 30" D.B.H. Cut out possibly 85 to 90M ft. per acre.

Ground, practically level in places, never steep enough to cause the logs to run, quite free of ravines and pot-holes, little brush or down timber. Seldom was it necessary to yard the logs more than 800 ft., the maximum average yarding distance being about 650 ft.

Miscellaneous Data.

Railroad Grading - hand work.

Ties - Contract price, 16¢ per tie, delivered along track. Not first-class ties.

Laying and Lifting Track - Superintendent states that this work cost the Company between $10 and $12 per station.

Market - Most of the cut was sold to the mills on the Sound.

Utilization.

Stand - Douglas fir, cedar and hemlock. Fir is the principal species. About 10% of the stand is hemlock. It, as has been shown, is cheap logging; $3.75 per M ft. placing the logs in the water ready for towing. The hemlock is taken down to 15" D.B.H., and to a smaller diameter when the tree is particularly good.

BD - 61

Deacidified using the Bookkeeper process.
Neutralizing agent: Magnesium Oxide
Treatment Date: Nov. 2012

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